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PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Technical Services Division of the Office of Pesticide Programs, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

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CONTENTS

Volume 9 July 1976 No. 7

Page

General 479
(News items, letters, and editorials appearing in scientific and technical journals; information on production and use; and other items of general interest)

Monitoring and Residues 483
(Levels of pesticides in people or nonexperimental animals or in water, air, soil, food, feed, and other consumer products)

Epidemiology, Prevention and Treatment 497
(Frequency and distribution of pesticide poisoning in man or nonexperimental animals and treatment of clinical cases; morbidity and mortality; safety measures; decontamination; disposal of containers and wastes; legislation and regulations)

Toxicology and Pharmacology 505
(Toxicity studies in man and animals; effects on cells; organs, and systems; metabolic studies, biochemistry, interactions; antidotes and other treatment; mode of action. Ordinarily, articles dealing with efficacy studies are not included.)

Analysis 533
(Preparation of samples; analytical methods; instrumentation)

76-1594. Heijbroek, W. (Biol. Dep., Inst. Ration. Suikerprod., Bergen op Zoom, The Netherlands). **Minimal usage of pesticides and alternatives for organochlorines.** *IIRB (Inst. Int. Rech. Betterav.) J.* 6(3): 127-137; 1973. (9 references)

A short term solution to the problem of unlimited pesticide usage may lie in the introduction of a system of pesticide usage which causes the least noxious side effects. Pesticide usage would be minimized by means of spray warning schemes or local applications and replacement of chlorinated hydrocarbons by less persistent chemicals. On the basis of experiments a spraying scheme was proposed which has led to a considerable decrease in the use of insecticides to control the mangold fly. A spray warning scheme has also been developed for aphids and virus yellows. In the case of aphids the problem is more complex as the aphids are only vectors and the damage is determined mainly by the presence of virus sources. This type of system is not applicable to seedling pests as adequate sampling methods are not yet available. However, it is possible to diminish the usage of pesticides by advising local applications such as seed dressings or seed furrow treatment. The results of field trials to replace organochlorines with organophosphates and carbamates do not seem too promising as yet. Compounds like diazinon, carbaryl, and lindane are more or less effective but do not reach the level of heptachlor.

76-1595. Lerer, M. A. L.; Huste, R. L. (Natl. Dep. Agric. Cattle Raising, Buenos Aires, Argentina). **Aspectos de la labor del Comite de Residuos de Plaguicidas del Codex Alimentario Mundial. [Some actions of the Pesticide Residues Committee of the World Codex Alimentarius Commission.]** *Jornadas Argent. Toxicol. Anal. Actas* 1: 92-102; 1971. (Spanish)

The Codex Alimentarius Commission was created by a joint act of the Food and Agriculture Organization and the World Health Organization to administer the food standards program. This commission in turn appointed the Pesticide Residues Committee to study and submit items for discussion to interested countries, also to recommend international tolerance levels for pesticide residues in various food products destined for human and animal consumption. The Committee was responsible for preparing a list of priorities regulating the studies and discussions that would tend to establish tolerance levels for the various pesticides in foods sold through international commerce. The Committee began work in 1966. Five meetings were held thus far. In 1966 a permissible daily intake level was established as a guideline for determining permissible residue levels in food. The 1967 session sought to fully clarify the definition of pesticide residues. The 1968 session considered the problem posed to developing countries by the establishment of tolerance limits and gave attention to the methods of determining pesticide residues. The 1969 session sought to establish a clearer relationship between tolerance and daily intake. In its 1970 meeting the Committee recommended more vigorous investigation of environment factors that lead to unintentional contamination with pesticide residues, as well as the replacement of "persistent" pesticides with those that are less persistent.

76-1596. Pineda, E. V. (IRAM, Buenos Aires, Argentina). **Normalizacion de metodos analiticos de residuos de plaguicidas. [Standardization of pesticide residue analysis methods.]** *Jornadas Argent. Toxicol. Anal. Actas* 1: 131-147; 1971. (Spanish)

The IRAM is a non-profit organization founded May 2, 1935, and recognized by the Argentine federal government, supported by government funding and money obtained from the sale of standards, certificates, seals of approval, etc. Over a period of 15 years, IRAM has compiled over 100 standards relating to insecticides, acaricides, herbicides, fungicides, nematocides, etc. A detailed classification of pesticides is given, together with a lengthy discussion of practical problems posed by the use of pesticides in agriculture. Emphasis is placed on the need for careful research on the domestic scene, since standards set up in other countries might not be relevant to the local situation. It is also important for each country to have accurate data when discussing permissible limits in international meetings, so as to confront "customer" countries with the problems of the "producer" country.

76-1597. Vanwetswinkel, G. (Opzoekingsstation, Gorsem, Belgium). **Ervaring met de geleide parasieten bestrijding. [Experiments with supervised pest control.]** *Parasitica* 31(2): 45-47; 1975. (Dutch)

The advantages and principles of supervised pest control are presented. Supervised pest control is based upon the steady monitoring of the pest population on fields and plants, and the application of pesticide is initiated only after a critical limit of population density is exceeded, a limit which is determined as a function of the expected damage without treatment and of the cost of the latter. Thus, it is possible to avoid unnecessary pesticide use with its ecological and hygienic consequences.

76-1598. Cutler, J. R. (Dep. Agric. Fish. Scotland, East Craigs, Edinburgh, Scotland). **A survey of sheep dip usage in Scotland, 1973.** *Pestic. Sci.* 6(6): 617-627; 1975. (5 references)

A survey of sheep dipping and spraying in Scotland during 1973 has shown that about 40 tons of organophosphorus, 8 tons of organochlorine and 2 tons of carbamate insecticides were used to control ectoparasites. Substances used to combat headfly (*Hydrotaea irritans*) and the main areas of Scotland affected by this pest are noted. Information about the pattern of dipping in relation to geographical area, season, and flock size and about the disposal of surplus dip and empty containers is presented. Though a small potential for environmental damage still exists no evidence of such came to light. (Author abstract by permission)

76-1599. Majumdar, J. C. (BASF India Ltd., Bombay, India). **Pesticides industry: some recent advances in research and development.** *Pesticides (Annual)* 8(12): 29-40; 1974. (31 references)

On an average, about 1/3 of world food is ravaged by pests and diseases and an additional 15-20% of the plant nutrients are removed by weeds. Available plant protection chemicals cannot solve all of the problems; new pesticides are needed to combat new problems. Recent advances in the development of systemic fungicides and selective herbicides are reviewed. The commercially viable systemic fungicides available today include benzimidazoles and thiophanates, oxathiins and carboxyanilides, pyrimidines, azepines, piperazines, organophosphates, and morpholines. However, systemic fungicides are still needed which are effective against the Phycomycetes group of fungi, and there is a need for improvement in the translocation properties of the chemicals within the plant. Furthermore, resistance to systemic fungicides has already been observed in certain cases. Herbicides should possess a high degree of selectivity, and their research and development is therefore more complicated and time-consuming than that associated with other groups of pesticides. The important groups of herbicides include the carbamic acid esters, nitrogen compounds, oxygen compounds, acid derivatives, and heterocyclic compounds, as well as miscellaneous compounds and various combinations of compounds. Recently, the focus of research and development in insect control has shifted to the biological insecticides (chemosterilants, sex attractants, and juvenile hormones).

76-1600. Besson, J.; Joly, E.; Touzeau, J. (Serv. Protect. Vegetaux, France). **Les actions secondaires des pesticides agricoles. [Side effects of agricultural pesticides.]** *Phytoma* 256: 15-22; 1974. (167 references) (French)

Agricultural pesticides, aside from affecting the pests and weeds they are supposed to control, may also affect auxiliary arthropods, phytophagous acarids, aphids, useful plants, or cause russeting of fruits. Resistant strains of originally sensitive species may develop due to the survival of genetically resistant, virulent, and well-adapted specimens. Pesticide treatment may facilitate the spread of certain animal species due to the destruction of their natural enemies, and vice versa. Secondary effects of 61 chemical and natural pesticides and biological preparations are listed.

76-1601. Tomov, A. (Author address not given). **Zam" rsyavanye i uvrezhdane na zhiznenata sreda s polikhloripani bifenili. [Pollution and damage to the environment from polychlorinated biphenyls.]** *Priroda (Sofia)* 23(4): 62-66; 1974. (Bulgarian)

In spite of the many similarities between DDT and polychlorinated biphenyls (PCB), the toxicity of the latter is much lower (1/13 that of DDT). Studies on the toxicity of PCB show that it not only pollutes the environment but also decreases animal populations. This is caused by PCB toxicity to the embryo and therefore high mortality to offspring during the first weeks of life. Precautions can be taken in the fight against damage from PCB byproducts: check fish from the sea and ocean for contamination (safe from 0.5-1 mg/kg), control the contaminated waste water from factories, and avoid packing food products in materials contaminated with PCB.

76-1602. Johnson, A. W. (Author address not given). **Man and insects.** *Proc. Annu. Sess., Ceylon Assoc. Adv. Sci.* 28(2): 31-40; 1973.

The application of toxic chemicals for insect control began in the latter half of the nineteenth century. Paris green, hydrogen cyanide, and lead hydrogen arsenate were used. The relative inefficiency of these inorganics and their high toxicity to humans led to the development of alternatives and particularly to specially designed synthetic organic compounds. Pyrethrum made a major contribution. Its advantages are its rapid knock-down on flies and its relative non-toxicity to mammals due to its easy metabolism. The addition of synergists increases its activity. However, the disadvantages of high cost and chemical instability are large. The potency of DDT as an insecticide was another major step. The initial outstanding success of this compound led chemists to investigate other possibilities among structurally relazed chemicals. Benzene hexachloride (BHC) showed considerable promise, especially as a seed dressing. However, its high toxicity caused prohibition of its application in many countries. Dieldrin and aldrin were also among the very active chlorinated cyclodienes. The great chemical stability and lack of volatility of the aforementioned insecticides render them especially effective where long contact time is required. Although resistance to insecticides can be a factor in insect control, it is stressed that this problem can be overstated. Resistant strains tend to be diluted by normal insects which have escaped the spray. Resistance does become a more important factor, however, where high intensity sprays are used. The withdrawal of DDT became confused by emotional issues on pollution in general. It is urged that a reasoned scientific approach be used to appraise any situation before such outright condemnation is again made. Before any new insecticide can be used on crops, requirements now exist which force strenuous testing to be performed. Further regulations deal with directions for use, precautionary measures, labeling, storage effects, and others. Thus, the work in launching a new chemical, and its cost, is greatly increased. However, research continues and methods of insect control other than chemical are under study. Attempts are made to enlist the aid of natural enemies of the insect, or sterilizing a large number of males by irradiation. Also the introduction of antimetabolites which interfered with the normal processes of metabolism within the body of the insect are being researched. Resistance of host plants towards insect attack can be sometimes increased.

76-1603. Smith, G. F.; (Eastside Mosq. Abatement District, Modesto, CA 95354). **Eolving ecological awareness as a basis for meeting the more difficult problems of the future.** *Proc. Pap. Annu. Cong. Calif. Mosq. Control Assoc.* 41: 80-81; 1973.

Ecology is defined as the dynamic interaction of all natural systems, organic and inorganic, living and dead. Ecological awareness has showed that insecticides have undesirable side effects and are often misused and that mosquitoes can develop a resistance to insecticides faster than new ones are developed. The greatest impact of ecology awareness on mosquitoes has been to slow down the development of new insecticides. Efforts to carefully select and use chemicals for mosquito control must be strengthened and encouraged. Dependence on insecticides for mosquito control must be reduced. It is urged that mosquito control programs be flexible in order to benefit from new technology and to adapt to the continuing evolution of the human society.

76-1604. Lipparini, L. (Ist. Merceol., Univ. Bologna, Bologna, Italy). **L'inquinamento da pesticidi dell'ambiente in rapporto alla qualita dei prodotti alimentari. [Pesticide pollution of the environment in relation to the quality of foods.]** *Quad. Merceol.* 12(2): 231-253; 1973. (50 references) (Italian)

A general review of the literature on environmental pollution by pesticides shows that the situation is not especially frightening except in the case of certain agricultural areas where use of pesticides is particularly intense. There, organochlorine pesticides are used; they are the most dangerous as they are found not only in soils and water, but also in vegetable and animal foodstuffs, and especially because they are very persistent. The fight against pollution should be geared to finding degradable pesticides. Great hope is being placed in "integrated control," a system aiming to control the phytophagous population and maintain it at levels where it cannot cause damage. In this connection, "third generation" pesticides are those capable of affecting biological cycles (growth hormones) and behavior of insects. In the meantime, research is also developing means of decontaminating soils, water, and plants by using microorganisms, certain chemical products, absorbent substances, or even UV radiation. Such procedures cannot yet be evaluated from technical, practical, and economic points of view.

76-1605. Lopez Capont, F. (I.A.T.A., Valencia, Spain). **Un tema al dia mercurio en pescados y sus conservas. [Mercury in fish and fish products.]** *Rev. Agroquim. Tecnol. Aliment.* 13(1): 72-80; 1973. (42 references) (Spanish)

A general review is given of environmental problems related to mercury pollution. Some insecticides contain up to 17% mercury, and such products have caused deaths in Guatemala and Mexico from poisoned pork. Sweden has appointed a commission to study this problem and has prohibited the use of methyl mercury in pesticides as of February 1966. The United States has established a mercury tolerance limit of 0.5 ppm. East and West Germany have more strict standards, while Japan, Sweden, Spain, and Italy permit 0.7 ppm for canned fish. There is presently much concern over the presence of mercury in fish and fish products, which has a serious effect on the international market in frozen and canned tuna fish. Under ideal circumstances, fish will always contain a higher concentration of mercury than other foods, and this is especially true of tuna and swordfish. In 1971, Spain produced 80,000 metric tons of tuna and 3,500 tons of swordfish. The greatest danger is presented by organic mercury compounds, which are unfortunately most common in fish.

76-1606. McKetta, John J. (Univ. of Texas, Austin, TX 77843). **Er vi pa vei mot undergangen? De 8 overraskelser. [Are we on the road to destruction? The 8 surprises.]** *Tek. Ukebl.* 122(50): 4-6; 1975. (Danish)

Optimistic views are presented on the major environmental phenomena recognized or suspected to be hazardous, such as the depletion of the oxygen, presence of carbon monoxide and nitrogen dioxide, water pollution, DDT, the dying off of animal species, and thermal pollution. The general environmental and toxicological hazards of DDT are far outweighed by the benefits it has offered, and especially by the fact that it has saved millions of human beings from malaria and other diseases. Recent studies seem to indicate that the increased fragility of eggshells, a cause of population declines in birds, is due mainly to mercury compounds rather than to DDT.

76-1607. Zonderwijk, P. (Plantenziektenkundige Dienst, Wageningen, The Netherlands). **Grenzgebiete beim Einsatz von Herbiziden - Schutz der Wildflora und Fauna. [Limitations in the use of herbicides - the protection of wild flora and fauna.]** *Z. Pflanzenkr. Pflanzenschutz* 82(5): 271-286; 1975. (25 references) (German)

Increasing attention has been given to the undesirable side effects of herbicides, particularly concerning the wild flora. Questions have been raised as to whether herbicide usage should be permitted on lawns, sportsgrounds, amenity plantings, roadways, and around and in residential areas. Questions are also raised concerning the sequence of chemicals used when alternating the growth-regulator application and high grassmowing system along public roadsides. Herbicides may be used to control undesirable vegetative growth on roadsurfaces. Herbicide treatment likewise is necessary between the rails although vegetation on railway banks and unused parts of the railroad yard may be valuable and thus should be protected against unnecessary side effects. The application of herbicides in waterways is also considered. Of particular concern are applications in which herbicides conflict with existing biological interactions.

76-1608. Klosterkoetter, S. (Inst. Hyg. Arbeitsmed., Univ. Klin. Gesamthochsch. Essen, Essen, Germany).

Hygiene als Umweltwissenschaft. [Hygiene as environmental science.] *Zentralbl. Bakteriol. Parasitenkd. Infektionskr. Hyg. Abt. 1, Orig. Reihe B* 158: 495-506; 1974. (40 references) (German)

General considerations on the significance of sanitation and hygienic aspects of environmental pollution are discussed. Experiences with DDT and other substances have clearly shown the need for comprehensive assessments of environmental impact and cost-benefit analysis for new materials intended for long-term extensive use.

76-1609. Vonesch, E. E.; Ordonez, C. R. (Dep. Chem., Sci. Agr. Vet. Med., Univ. Buenos Aires, Buenos Aires, Argentina). **Estabilidad del carbaryl en zumos.** [**Stability of carbaryl in juices.**] *Jornadas Argent. Toxicol. Anal. Actas* 1: 40-43; 1971. (5 references) (Spanish)

The persistence and stability of arylam (carbaryl) in spiked fruit and vegetable juices was monitored by determining the amount of insecticide present using a color reaction described in a previous article in this series (see abstract No. 76-1832). The juices of grapefruit, tomatoes, lettuce, apples, pears, and radishes were utilized. Stability was tested by heat treatment at 100°C for 1-2 hours and at 120°C for 30 minutes. Persistence was tested by incubation at 37°C for as long as 45 days (tomatoes and grapefruit). Sodium sulfite was used as a preservative during incubation. Residues of arylam were present initially in the tomato, grapefruit, radish and lettuce juices; these were highly persistent (remaining at 33 and 30 μg/ml respectively) after 45 days of incubation and after the two heat treatments. The 120° treatment did cause a 14% decrease in tomato juice and 9% in grapefruit juice.

76-1610. Kesten, E. M.; Kempny, R. S. G. (Forensic Toxicol. Chem. Lab., School of Natural and Exact Sciences, Univ. Buenos Aires, Buenos Aires, Argentina). **Investigacion de residuos de pesticidas organoclorados en mantecas y margarinas.** [**Study of organochlorine pesticide residues in butter and margarines.**] *Jornadas Argent. Toxicol. Anal. Actas* 1: 85-91; 1971. (15 references) (Spanish)

Gas chromatography with electron capture detection was used to determine the concentrations of the insecticides HCH (BHC) and dieldrin in six brands of butter and five brands of margarine. HCH content varied from 0.06 to 0.54 ppm in the butter and from 0.01 to 0.05 ppm in the margarines. Dieldrin values varied from 0.02 to 0.19 in the butter samples, while dieldrin could not be detected in margarine with the equipment used, which was sensitive enough to detect 0.1 nanograms. The recovery rate for the insecticides was 90%. The considerably lower residue concentration in the margarines was explained as reflecting the type of processing used in the preparation of margarines, which includes a deodorizing process that tends to eliminate pesticide residues.

76-1611. Garcia Fernandez, J. C.; Astolfi, E.; Juarez, M. B.; Piacentino, H. (Dep. Forensic Toxicol. Chem., Sch. Pharm. Biochem., Univ. Buenos Aires, Buenos Aires, Argentina). **Plaguicidas clorados en grasa human infantil en la Republica Argentina.** [**Chlorinated pesticides in the adipose tissues of children, Republic of Argentina.**] *Jornadas Argent. Toxicol. Anal. Actas* 1: 106-130; 1971. (22 references) (Spanish)

This study was conducted on children because of their higher affinity for extraneous substances in the environment, and the adipose tissues were investigated because of the known tendency for organochlorine compounds to accumulate there. The technique used was that described in the FDA Pesticide Analytical Manual, Vol. 1, General Methods for Fatty Food. The samples were obtained from autopsies done on human subjects of both sexes, 16 years of age or younger. Determinations were done by gas chromatography for heptachlor, heptachlor epoxide, α-, β-, and γ-BHC, dieldrin, endrin, *p,p'*-DDT, *o,p'*-DDT, and *p,p'*-DDE. All of the 52 samples analyzed contained *p,p'*-DDT. A graph drawn of data from the children eight years or younger gave a Gaussian curve, with the highest frequency between 3 and 4 ppm. The presence of α- and β-BHC was detected in 50 samples, and γ-BHC (lindane) in 38 samples. Dieldrin was present in 47 of 49 samples, aldrin in 3 of 52. Heptachlor was detected in 18 samples and quantitatively determined in 12. Heptachlor epoxide was quantitatively analyzable in 36 of 51 samples. Accumulation was slightly higher in males.

76-1612. Ruveda, M. A. (Special Org. Chem. Group, Armed Forces Inst. Sci. Tech. Res., Buenos Aires, Argentina). **Reacciones no enzimaticas de los compuestos organofosforados.** [**Non-enzymatic reactions of organophosphorus compounds.**] *Jornadas Argent. Toxicol. Anal. Actas* 1: 148-156; 1971. (4 references) (Spanish)

The organophosphorus compounds are of special interest as pesticides because of their rapid degradability. The present state of knowledge is reviewed concerning the chemical properties of these compounds and the effects of chemical substitutions, oxidation, photochemical reactions, dehydrohalogenation, secondary hydrolysis, catalysis, and isomerization.

76-1613. Sturrock, R. F. (Res. Control Dep., P.O. Box 93, Castries, St. Lucia, West Indies). **Persistence of the molluscicide Bayluscide (clonitralide) emulsifiable concentrate on mud surfaces in the tropics.** *Ann. Trop. Med. Parasitol.* 68(4): 427-434; 1974. (21 references)

Studies were made to determine if clonitralide, the active ingredient of the molluscicide Bayluscide, is actually non-persistent, so that the chemical could be used to control the intermediate host of *Schistosoma mansoni*, the snail *Biomphalaria glabrata*. Aqueous solutions of an emulsifiable concentrate of clonitralide were sprayed onto pans containing dried mud or mud covered with 2.5 cm of water. All snails which were present at the time of spraying were killed, regardless of the presence or absence of water. Mortalities were high in similar, unsprayed pans, but subsequent chemical and biological assays demonstrated that clonitralide remained active for over a year under tropical conditions, in spite of several cycles of wetting and drying. Clonitralide residues on vegetation sprayed in an operational snail control program remained at toxic levels for 8 weeks when exposed to full sunlight, heavy rainfall, temperatures of 20 - 30°C, and relative humidities of 70 - 95%. It is concluded from these findings that clonitralide may be of great value not only in controlling schistosomiasis, including *S. japonicum*, but also in controlling other snail-borne diseases such as fascioliasis. It may also

be of use in controlling agricultural aquatic snail pests that attack young rice plants.

76-1614. Ushio, F.; Fukano, S.; Nishida, K.; Kani, T.; Doguchi, M. (Tokyo Metropolitan Res. Lab. Publ. Health, Tokyo, Japan). [**Some attempts to estimate the total daily intake of pesticide and PCB residues and trace heavy metals.**] *Tokyo-Toritsu Eisei Kenkyusho Kenkyu Nenpo (Annu. Rep. Tokyo Metrop. Res. Lab. Pub. Health)* 25:307-312; 1974. (15 references) (Japanese)

Based on the diet of an average 20-29-yr-old male, the dietary intake of pesticide and PCB residues as well as total Hg, Cd, and Pb was estimated. Food materials representing a 4-day diet were purchased at retail and department stores in Tokyo. The uncooked foods were divided into four food groups (cereals, fish and shellfish, meat and dairy products, vegetables, and seasonings) and analyzed. The estimated average daily intakes were PCB, 8 μg; BHC, 3.5 μg; total DDT, 4.7 μ; dieldrin, 1.7 μg; total Hg, 35 μg; total Cd, 38 μg; and total Pb, 250 μg, respectively.

76-1615. Bauza, C. A. (Catedr. Pediatr. Hosp. "Pereira Rossell", Fac. Med., Univ. Republica, Uruguay). **Contaminacion ambiental y el nino. II. Residuos de insecticidas clorados en leche de madres de montevideo (2° estudio) y leche desecada integral de vaca. [Environmental pollution and children. II. Organochlorine pesticide residues in milk of mothers in Montevideo and in whole powdered cow's milk.]** *Arch. Pediatr. Uruguay* 46(3): 139-148; 1975. (20 references) (Spanish)

Organochlorine pesticide residues were determined by gas chromatography in pooled milk from mothers on a low socioeconomic level residing in Montevideo. Powdered whole cow's milk was similarly examined. The following levels were found in the mother's milk (expressed in ppm): HCB 0.011; alpha-BHC 0.024; beta-BHC 0.036; dieldrin 0.003; total DDT 0.074; lindane, heptachlor epoxide, and PCBs were not detected. In 15% reconstituted liquid cow's milk the following levels were found (lipids: 3.3 g/100 ml); total BHC 0.024; alpha-BHC 0.002; dieldrin 0.008; and total DDT 0.003. No residues were detected for beta-BHC, lindane, heptachlor epoxide, or PCBs. The results of the study indicated the levels of dieldrin and HCB concentrations to be above those tolerated by international organizations.

76-1616. Varty, I. W.; Yule, W. N. (Maritimes Forest Res. Cent.; Dep. Environ., Canadian Forestry Service, Fredericton, New Brunswick, Canada). **The persistence and fate of phosphamidon in a forest environment.** *Bull. Environ. Contam. Toxicol.* 15(3): 257-264; 1976. (9 references)

An area in New Brunswick with typical fir-spruce forest cover was sprayed with an aqueous solution of phosphamidon, which was applied by aircraft at a rate of 210 g phosphamidon/1.4 liter water/ha. Foliage, soil, and water from the treated area were collected before and at intervals up to 127 days after treatment. Insecticide residues were measured using flame photometric gas-liquid chromatography. The phosphamidon spray penetrated various superficial aspects of the biome, but the half-lives in several types of foliage, soil, and water were only a few days. The residues appeared to be less persistent on flushing buds of spruce and fir than on 1-yr-old foliage. Persistence was lowest in the stream water samples, no phosphamidon being detected after day 2. The *cis* (beta) isomer of phosphamidon showed a more rapid rate of dissipation in the forest environment than the *trans* isomer.

76-1617. El Zorgani, G. A. (Agr. Res. Corp., Wad Medani, Sudan). **Persistence of organochlorine insecticides in the field in the Gezira soil under cotton.** *Bull. Environ. Contam. Toxicol.* 15(3): 378-382; 1976. (16 references)

High volume knapsack sprayers were used to apply DDT (E.C. 25%), endosulfan (E.C. 35%), dieldrin (W.P. 75%), and aldrin (W.P. 40%) to the ridge surface immediately under the plants in a cotton field in Gezira, Sudan. The application rate was 2 lb a.i./feddan. Soil samples were analyzed by gas-liquid chromatography. The endosulfan and aldrin residue levels fell below 1 ppm within 3 weeks after application, while dieldrin and DDT fell below 1 ppm within 7 weeks. When compared with previous findings in temperate regions, these data demonstrate the shorter persistence of organochlorine insecticides under Gezira conditions.

76-1618. Chow, P. N. P. (Res. Stn., Res. Branch, Agric. Can., Brandon, Manitoba, Canada). **Distribution of ^{14}C residue of TCA-^{14}C in vegetative and grain parts of oats and wheat.** *Can. J. Plant Sci.* 56(1): 39-43; 1976. (12 references)

A TCA-^{14}C solution at .18 μM (2.42 μCi) was applied to the roots of 22-day-old greenhouse seedlings of oats (*Avena sativa* L.) and wheat (*Triticum aestivum* L.). Over a period of 42.5 hr, wheat roots absorbed three times as much TCA-^{14}C as oat roots (41.4 vs. 13.2%). A substantial reduction of ^{14}C residues in shoots and roots in both crops occurred within 6 wk after absorption and then they remained relatively constant in shoots. Most of the absorbed ^{14}C (89.9-93.7% in oats and 88.8-98.3% in wheat) was distributed in shoots. Oat roots retained more ^{14}C (3.6-8.4%) than wheat roots (0.7-3.6%). Small percentages of ^{14}C residues were found in seeds (0.4-1.4% in oats and 1.8-6.6% in wheat), and about an equal amount in the chaff. Wheat seeds (0.09-0.19 ppm) tended to accumulate more ^{14}C than oat seeds (0.01-0.03 ppm). (Author abstract by permission)

76-1619. Sundaram, K. M. S. (Chem. Control Res. Inst., Ottawa, Ontario, Canada). **DDT residues may be lost from soil by direct volatilization.** *Bi-Monthly Res. Notes Can. For. Serv.* 30(2): 14-15; 1974. (3 references)

Large quantities of technical DDT were sprayed on New Brunswick forest areas between 1952 and 1968 to control the spruce budworm (*Choristoneura fumiferana*). The relative concentrations of the various DDT isomers and DDE in air samples collected 0 and 6 ft above the ground were determined using electron capture gas chromatography. Appreciable amounts of DDT residues in Priceville forest soil were dissipated by volatilization. The *o,p'*-isomer disappeared more rapidly from the soil than *p,p'*-DDT, the average *o,p*:*p,p'* ratios being 0.76 at ground level and 2.02 at 6 ft; the soil ratio was 0.15. The average concentration of the *o,p'*-isomer at ground level was 8.56 ng/m^3 and at 6 ft it was 11.34 ng/m^3; the corresponding values for *p,p'*-DDT were 11.63 and 5.55 ng/m^3, respectively. The variation in concentration of the DDE metabolite at the two levels was not appreciable. The average DDE:*p,p'*-DDT ratio was 0.37 at ground level, 0.73 at 6 ft, and 0.11 in the soil.

76-1620. Sellers, L. G.; Owens, J. C.; Tollefson, J. J.; Dahm, P. A. (Dep. Zool., Louisiana Tech. Univ., Ruston, LA 71270). **Residues of terbufos (Counter) in Iowa corn and soil.** *J. Econ. Entomol.* 69(2): 133-135; 1976. (2 references)

Field corn, sweet corn, popcorn, and soil from Iowa fields were analyzed for residues of terbufos (Counter), *O,O*-diethyl *S*[(*tert*- butylthio) methyl] phosphorodithioate. A granular formulation (Counter 15-G) was applied at the time of planting as a band or furrow treatment of 1, 2, and 4 lb AI/acre. Residues of terbufos, expressed as the fully oxidized sulfone (*O,O*-dimethyl *S*-[(*tert*- butylsulfonyl) methyl] phosphorothiolate), in field corn forage ranged from a high of 0.43 ppm 40 days post-treatment (4 lb furrow application) to a nondetectable amount 60 days post-treatment (1 lb band application). No detectable residues were found in field corn grain, plus cob, harvested for silage (100 days post-treatment), and quantities in stover of the same maturity showed only 0.01-0.04 ppm. Analyses of fully mature grain (160 days) showed no residues. Quantities of terbufos in soil where field corn was grown ranged from 78 ppm immediately after application (4 lb furrow application) to 0.3 ppm 160 days post-treatment (1 lb band application). Sweet corn grain and popcorn grain sampled at edible maturity showed no residues of terbufos even though 10-14 ppm still were in the accompanying soil. (Author abstract by permission)

76-1621. Ivey, M. C.; Palmer, J. S.; Washburn, R. H. (U. S. Livestock Insects Lab., Kerrville, TX 78028). **Famphur and its oxygen analogue: residues in the body tissues of reindeer.** *J. Econ. Entomol.* 69(2): 260-262; 1976. (9 references)

At 24 hr after reindeer received a single intramuscular injection of famphur at 15 mg/kg body weight, residues were found preponderantly in fatty tissue (8.05-9.14 ppm), except for the injection-site muscle. There residues ranged from 0.233-635.2 ppm. This variance demonstrates the difficulty of analyzing the true injection site. Nevertheless, famphur (for some period less than 1 wk) apparently has a depot effect in injection-site muscle after an injection. At 1 wk post-treatment, residues of 0.031-0.192 ppm of famphur were found in fat; 1 injection-site muscle and 1 liver tissue contained residues of 0.026 and 0.031 ppm, respectively. Famphur residues in fat declined steadily through 5 wk, and none were detectable in tissues other than fat at 5 wk post-treatment. No oxygen analogue (dimethyl *p*-dimethylsulfamoyl phenyl phosphate) was found above the lower limit of sensitivity (0.06 ppm) of the method. (Author abstract by permission)

76-1622. Anonymous. **Researchers learn new methods to control pesticide drift.** *Miss. Agric. For. Exp. Stn. Res. Highlights* 38(9): 4; 1975.

Crop injury from herbicide drift has increased markedly in recent years. Factors having the greatest influence on herbicide drift include wind speed and the size of the particles ejected from the spray nozzles. The following practices will help minimize the problem of drift: spray at the time of day, usually early morning or late afternoon and evening, when average wind speeds are lowest; get an agricultural weather advisory to help in planning when to spray (wind speeds are usually lowest when the center of a high pressure system is over an area); decrease spray nozzle pressure; use nozzles with the largest hole size to distribute herbicides evenly; lower spray nozzles as much as possible for an over-the-top soil application; use an anti-drift additive in the herbicide to increase water viscosity and droplet size; and, where timing is critical, such as along ditch banks and in pastures, spray in early summer when wind speeds are lower.

76-1623. Van Wambeke, E.; Vanachter, A.; Van Assche, C. (Lab. Ftyopathol. Plantenbescherming, Katholieke Univ., Louvain, Belgium). **Some factors affecting bromide residues in soil and plant.** *Meded. Fac. Landbouwwetensch. Rijksuniv. Gent* 39(2 Pt. 2): 1311-1324; 1974. (10 references)

The effects of contact time, soil composition, relative soil moisture content, and leaching on the bromide residues remaining in the soil after disinfection with methyl bromide were studied. The effects of dose, soil composition, plant nutrient concentration in the soil, and concentration of Cl and NO_3 ions in the soil on the bromide residues in tomato lettuce, spinach, carrot, and radish plants grown in methyl bromide-treated soil were also studied. The results indicated that the bromide residues after fumigation were lower in sandy loam soil than in peat soil. The residues in the leaves and fruits of plants grown in the sandy loam soil were also lower than those in the leaves and fruits of plants grown in peat soil, although the residue levels in the roots were higher in plants grown in sandy loam soil. The residue levels in the crops were decreased by fertilization and by the addition of Cl and NO_3 ions to the soil. The bromide residues in the plants increased with

increasing active organic matter content and increasing relative soil moisture content. Leaching decreased the residue levels in the plants.

76-1624. Hiltbold, A. E.; Hajek, B. F.; Buchanan, G. A.; Scarsbrook, C. E. (Agron. Soils Dep., Auburn Univ. Agric. Exp. Stn., Auburn, AL). **Leaching of picloram and nitrate in two Alabama soils.** *Natl. Tech. Inform. Serv.* PB 236 856A, 1974, 21 p. (4 references)

The leaching and dispersion characteristics of nitrate (200 and 800 lb N/A from $NaNO_3$) and picloram (applied as broadcast spray at 10 lb acid equivalent per acre on disked and smoothed soil) in two Alabama soils (Dothan loamy sand and Hartsells fine sandy loam) were studied. Applications were made on September 14, 1971 and April 12, 1972 at one experimental site and on October 12, 1971 at another site. Soil samples were collected at intervals over a 16-month period, and picloram was determined in a soil bioassay using Bragg soybeans. The nitrate moved downward in both soils at a rate of about 1 in. per in. of rainfall received. Some picloram was retained in the surface soil, whereas all nitrates were eventually leached below the soil surface. The picloram that was leached below the surface soil moved downward at about the same rate as the nitrate. The rates of leaching of the 200- and 800-lb N/A applications were essentially equal. A mathematical model of nitrate leaching was developed that fit the observed leaching pattern in these soils within the range of field sampling precision.

76-1625. Unterhalt, B. (Fachbereich Pharm. Lebensmittelchem., Phillips-Univ., D-355 Marbug a.d. Lahn, Germany). **Potentielle Gefahrdung durch Schadstoffe in Lebensmitteln — ein Beitrag zum Umweltschutz.** [**Potential hazard from toxic substances in foods — environmental protection.**] *Oesterr. Apoth. Ztg.* 29(1): 1-6, 8-10, 15-16; 1975. (74 references) (German)

Food contains many types of toxic compounds, both natural and man-made, and the most common of these are discussed. The natural toxins include tetrodotoxin, muscarine, etc. The man-made poisons include pesticides, other agricultural chemicals, and some food additives. Also discussed are atmospheric pollutants and their incorporation into foods. Organochlorine pesticides and PCBs have been the most widely occurring food contaminants, although they are rarely found at acutely toxic levels. The presence of some pesticide residues in foods is unavoidable at present, but efforts should be directed toward eliminating them in the future.

76-1626. Hoffman, R. D. (Ohio Cooperative Wildl. Res. Unit, Columbus, OH 43210). **Mercury levels in a 21-year old black-crowned night heron (*Nycticorax nycticorax*).** *Ohio J. Sci.* 76(1): 18; 1976. (4 references)

The use of mercury in agricultural practices has helped to raise the concentrations of mercury in the environment to levels which may be toxic to animals. A 21 yr old female black-crowned night heron with total body weight of 765 g was collected and examined. Organisms in the stomach included two perch and one fresh-water drum. The total mercury concentrations in breast muscle (0.9 ppm), liver (3.1 ppm), brain (0.5 ppm), and primary wing feathers (17.9 ppm) were measured on a wet weight basis, in duplicate. Differences between the concentrations in this particular bird and other herons found earlier indicate that this bird may have been feeding in an area of lower mercury contamination or that the maximum retainable mercury in black-crowned night herons is specific for the individual.

76-1627. Ogawa, T.; Kanamaru, N. (Dep. Agric. Chem., Tokyo Metrop. Agric. Exp. Stn., Tokyo, Japan). [**Persistence of diazinon residue on crops.** *Showa 49-Nendo Kenkyu Sokuho Tokyo-To Nogyo Shikenjo (Prompt Rep. Res. Tokyo Metrop. Agric. Exp. Stn.* 40-41; 1974. (Japanese)

An aqueous emulsion of diazinon (50% EC, diluted 100 fold) was sprayed at the rate of 200 l/10 Are on field-grown seasoning greens, Chinese cabbage, turnip, eggplant, and garland chrysanthemum. The residue of diazinon was then determined. Residues in seasoning greens were over 0.1 ppm 21 days after application, then gradually decreased. In the edible part of Chinese cabbage (after removing the outermost leaf), residues were over 0.1 ppm, 21 and 28 days after application; then they gradually decreased. In leaves of turnip, the residue was less than 0.1 ppm, 21 and 28 days after application. In egg plant fruits, residue levels declined 50% one day after application, dropped to 0.01 ppm 3 days after application, and became almost undetectable on the 4th day after application. Residue in garland chrysanthemum was nearly 40 ppm one day after application. The abnormally high residue levels of pesticides in garland chrysanthemum were previously noted in the case of malathion and fenitrothion. The relatively high persistence of diazinon should be considered.

76-1628. Kanamaru, N.; Ogawa, T. (Dep. Agric. Chem., Tokyo Metrop. Agric. Exp. Stn., Tokyo, Japan). [**On the dissipation of dichlorvos in water.**] *Showa 49-Nendo Kenkyu Sokuho Tokyo-To Nogyo Shikenjo (Prompt Rep. Res. Tokyo Metrop. Agric. Exp. Stn.)* 42-43; 1974. (Japanese)

Dichlorvos dissipation in stagnant water was studied after residue determination in two rivers (0.0083 and 0.0023 ppm). After 24 hr, 65% dissipation of the initial quantity was found at temperatures of 4 to 23°C. The rate of dissipation was moderate at a water pH of 1.6-7.3; greater at pH 10.1; and still greater at pH 12.8. No determinations were possible after 1 hr. Malathion, fenitrothion, diazinon, and endrin did not dissipate after 24 hr at 30°C. When dichlorvos was transferred from an aqueous solution to benzene, dichlorvos in benzene left some slight residues, even after bubbling with pumped air. This preliminary data indicates that dichlorvos dissipation in water is due to evaporation.

76-1629. Richard, J. J.; Junk, G. A.; Avery, M. J.; Nehring, N. L.; Fritz, J. S.; Svec, H. J. (Energy and Mineral Resources Res. Inst., Iowa State Univ., Ames, IA 50010). **Analysis of various Iowa waters for selected pesticides: atrazine, DDE, and dieldrin-1974.** *Pestic. Monit. J.* 9(3): 117-123; 1975. (16 references)

Atrazine, DDE, and dieldrin were extracted and concentrated from various surface, subsurface, and finished waters using the macroreticular resin method. Organic components in the concentrates from these waters were separated by gas chromatography; the amounts of the three pesticides in the waters ranged from 0.5 to 42,000 parts per trillion by weight. Every major watershed in the State of Iowa revealed some degree of pesticide contamination and seasonal variations were consistent with agricultural runoff models. Atrazine concentrations were highest of the three pesticides, a symptom of its widespread use in the corn belt. DDE also appeared in substantial quantities, providing further evidence of the persistence of DDT and its metabolites. Water from several shallow wells and finished water from many water treatment plants were also contaminated. Current treatment processes do not effectively remove these pesticides. (Author abstract by permission)

76-1630. Wojcik, D. P.; Banks, W. A.; Wheeler, W. B.; Jouvenaz, D. P.; Van Middelem, C. H.; Lofgren, C. S. (Insects Affecting Man Lab., Agric. Res. Serv., U. S. Dep. Agric., Gainesville, FL 32604). **Mirex residues in nontarget organisms after application of experimental baits for fire ant control, southwest Georgia—1971-72.** *Pestic. Monit. J.* 9(3): 124-133; 1975. (17 references)

Mirex, the only compound approved for control of the red imported fire ant (*Solenopsis invicta*) and the black imported fire ant (*Solenopsis richteri*), is normally applied at a rate of 1.40 kg/ha (1.25 lb/acre). Influenced by recent studies showing that low levels of mirex are toxic to certain nontarget organisms, particularly estuarine species, authors report here on a monitoring study of mirex in three large treatment areas of southwest Georgia. Four formulations of bait were applied aerially in 1971-72. Low-level residues were observed in small terrestrial vertebrates and invertebrates and in fresh-water inhabitants. Levels detected were about the same for all baits. Maximum residues were detected 1-3 months after treatment and gradually declined to low levels of 0.02-1.16 ppm 1 year after treatment. (Author abstract by permission)

76-1631. Albright, L. J.; Northcote, T. G.; Oloffs, P. C.; Szeto, S. Y. (Dep. Biol. Sci., Simon Fraser Univ., Burnaby, British Columbia, Canada). **Chlorinated hydrocarbon residues in fish, crabs, and shellfish of the lower Fraser River, its estuary, and selected locations in Georgia Strait, British Columbia—1972-73.** *Pestic. Monit. J.* 9(3): 134-140; 1975. (19 references)

Between August 1972 and September 1973, fish, crabs, and shellfish were collected from the lower Fraser River, its estuary, and selected areas of Georgia Strait in British Columbia. Samples were analyzed for aldrin, dieldrin, α- and γ-chlordane, p,p'-DDT, p,p'-DDE, p,p'-DDD (TDE), heptachlor, heptachlor epoxide, lindane, and polychlorinated biphenyls (PCBs). Of these, p,p'-DDT, p,p'-DDE, p,p'-DDD, heptachlor epoxide, and one PCB, Aroclor 1254, were detected in samples of many fish, crabs, and shellfish from the lower Fraser River and its estuary. Generally, compounds found in decreasing order of magnitude in samples from the Fraser River and its estuary were: PCB's, p,p'-DDE, heptachlor epoxide, p,p'-DDT, and p,p'-DDD. Greatest concentrations of these compounds occurred in biota from the waters adjacent to the City of Vancouver. With one exception, animals from Georgia Strait and those away from the immediate influence of Fraser River water contained no detectable levels of chlorinated hydrocarbons. (Author abstract by permission)

76-1632. Bevenue, A.; Ogata, J. N.; Tengan, L. S.; Hylin, J. W. (Univ. Hawaii, Honolulu, HI 96822). **Mirex residues in wildlife and soils. Hawaiian pineapple-growing areas—1972-74.** *Pestic. Monit. J.* 9(3): 141-149; 1975. (9 references)

A monitoring program was conducted in the pineapple-growing areas of Hawaii from 1972 to 1974 to survey mirex residues in sediments, soils, and aquatic and terrestrial wildlife. Residues in pineapple field soils ranged from 3 to 18 ppb 9 months after mirex had been applied. No residues were found in the sediments. Only 8 fish of 110 aquatic animals sampled contained mirex; these levels were low and ranged from 3 to 7 ppb. Mirex residues in birds ranged from undetectable to 10 ppm; residues in rodents were quite variable, but in terms of the geometric mean, the amounts in the Polynesian rat decreased with time from 1,270 to 56 ppb. Similarly, values for the roof rat ranged from 666 to 17 ppb. The geometric mean for residues in mongooses decreased from 2,200 ppb immediately after application to 238 ppb 39 weeks later. Aerial application of mirex to the pineapple fields did not contaminate the marine environment of Hawaii and no evidence of mirex residue buildup in the aquatic food chain was apparent. Mirex accumulation in terrestrial biota was temporary; there was no definitive indication of permanent accumulation in the wildlife of the areas studied. (Author abstract by permission)

76-1633. Wyllie, J. A.; Gabica, J.; Benson, W. W.; Yoder, J. (Idaho Epidemiol. Stud. Project, Dep. Health and Welfare, Statehouse, Boise, ID 83720). **Exposure and contamination of the air and employees of a pentachlorophenol plant, Idaho—1972.** *Pestic. Monit. J.* 9(3): 150-153; 1975. (14 references)

A pentachlorophenol (PCP) wood treatment plant was studied to determine PCP exposure to people by occupation and to the plant by work area. This plant operates on a year-round basis with a 25 percent increase in produc-

tion from May through October. Approximately 2.5 million board feet of timber are processed annually. Samples were taken in the morning of the second work week of each month for 5 consecutive months. Samples consisted of serum and urine from the employees and air from locations throughout the plant work area. All samples were analyzed for PCP residue. Peripheral blood was used to culture cells to investigate possible chromosomal aberrations. (Author abstract by permission)

76-1634. White, D. H.; Kaiser, T. E. (Fish Wildl. Serv., U.S. Dep. Inter., Patuxent Wildl. Res. Cent., Laurel, MD 20811). **Residues of organochlorines and heavy metals in ruddy ducks from the Delaware River, 1973.** *Pestic. Monit. J.* 9(45: 155-156; 1976. (4 references)

In December 1973, eight ruddy ducks killed in an oil spill on the Delaware River were collected to be analyzed for residues of environmental pollutants. Whole carcasses were analyzed for organochlorine pesticides and livers were examined for lead, cadmium, and mercury. Residues of polychlorinated biphenyls and DDT and/or its metabolites were present in all carcasses. Dieldrin and hexachlorobenzene were present in seven of the eight samples. All livers contained detectable levels of lead, cadmium, and mercury. (Author abstract by permission)

76-1635. Johnson, R. D.; Manske, D. D. (Kansas City Field Off. Lab., Food and Drug Admin., U. S. Dep. Health, Educ., and Welfare, Kansas City, MO 64106). **Pesticide residues in total diet samples (IX).** *Pestic. Monit. J.* 9(4): 157-169; 1976. (19 references)

During the ninth year of the Total Diet Study, pesticide residues remained at the relatively low levels reported previously. Thirty market baskets were collected in 30 cities which ranged in population from less than 50,000 to 1,000,000 or more. Averages and ranges of residues found are reported for the period August 1972 through July 1973 by food class. Lead, selenium, and zinc data are included for the first time. During this period, the individual items used in making up the dairy and meat composites in four market baskets were analyzed for pesticides and the results are included. Results of recovery studies within various classes of residues are also presented. (Author abstract by permission)

76-1636. Reimold, R. J.; Shealy, M. H., Jr. (Univ. Georgia Mar. Resources Ext. Cent., Brunswick, GA 31520). **Chlorinated hydrocarbon pesticides and mercury in coastal young-of-the-year finfish, South Carolina and Georgia—1972-74.** *Pestic. Monit. J.* 9(4): 170-175; 1976. (13 references)

Pesticides and heavy metals were monitored in fish collected from 11 estuaries representing all the Atlantic drainage basins in Georgia and South Carolina. Part of the U. S. Environmental Protection Agency National Estuarine Monitoring Program, the semiannual survey of young-of-the-year fishes was conducted from 1972 to 1974. Data is intended to provide an initial base line for residue levels in the fish studied in these waters. Dieldrin was found in 2 percent of the samples, DDT and metabolites were in 33 percent, polychlorinated biphenyls were in 4 percent, and mercury was in 47 percent. Noticeably absent were any measurable residues of toxaphene even though there is a toxaphene manufacturing plant in Brunswick, Ga. (Author abstract by permission)

76-1637. White, D. H.; Heath, R. G. (Fish Wildl. Serv., U. S. Dep. Int., Patuxent Wildl. Res. Cent., Laurel, MD 20811). **Nationwide residues of organochlorines in wings of adult mallards and black ducks, 1972-73.** *Pestic. Monit. J.* 9(4): 176-185; 1976. (11 references)

Organochlorine residues in wings of adult mallards and black ducks were monitored during the 1972-73 hunting season. DDE, DDT, DDD, dieldrin, and polychlorinated biphenyls (PCB's) were present in all samples. Mallard wings from Alabama contained the highest mean levels of DDE, DDT, DDD, dieldrin, and PCB's. Mallards and black ducks from the Altantic Flyway and mallards from the Pacific Flyway contained significantly lower DDE residues than in 1969-70. Black ducks from the Atlantic Flyway contained significantly less dieldrin than in 1969-70, and mallards in the Central and Pacific Flyways contained significantly lower levels of PCB's. As in 1969-70, DDE residues were lowest in the Central Flyway and highest in the Atlantic Flyway. The average PCB level remained unchanged in the Atlantic Flyway but was higher in the Mississippi Flyway than in 1969-70, probably because of the unusually high levels in Alabama samples. All organochlorine residues in black ducks from the Atlantic Flyway significantly correlated. DDE concentrations in mallards from the Atlantic Flyway significantly correlated with those of DDT, DDD, and PCB's. (Author abstract by permission)

76-1638. Kellogg, R. L.; Bulkley, R. V. (Iowa Coop. Fish. Res. Unit, Iowa State Univ., Ames, IA 50011). **Seasonal concentrations of dieldrin in water, channel catfish, and catfish-food organisms, Des Moines River, Iowa—1971-73.** *Pestic. Monit. J.* 9(4): 186-194; 1976. (20 references)

Concentrations of dieldrin in aquatic insects, crayfish, minnows, and small carpsuckers, and muscle tissue of channel catfish (*Ictalurus punctatus*) were compared with the dieldrin content of Des Moines River water in 1971-73. Monthly mean concentrations of dieldrin in river water and most aquatic organisms were highest in June and July, soon after aldrin had been applied to corn land in the watershed. Several groups of aquatic organisms also exhibited high dieldrin levels in the fall when the dieldrin content of river water was seasonally low. The influence of temperature on metabolic rate and enzyme activity and the differences in body fat content were suggested as probable causes of variations observed in the

dieldrin content of aquatic organisms. (Author abstract by permission)

76-1639. Buchenauer, H. (Lehrstuhl Phytopathol. Pflanzenschutz, Univ. Hohenheim, Stuttgart, Germany). **Inactivation of triforine by u.v. and sunlight on glass and on leaves of bean plants.** *Pestic. Sci.* 6(6): 553-559; 1975. (14 references)

Triforine is sensitive to UV and sunlight. The photochemical inactivation rate was higher in aqueous solution than in the solid state. In aqueous solution 50% of triforine was inactivated after 3 hr irradiation with UV light and after 30 hr exposure to sunlight. Eighty hours were necessary to decompose 25% of triforine in the solid state with sunlight on glass. The half life of triforine residues on the leaves of bean plants was about 60 hr when exposed to solar irradiation. The inactivation of triforine by UV light and sunlight was accelerated in the presence of the sensitizing chemicals riboflavin and xanthene; however, rhodamine B (C.I. 45170) showed only a small photosensitizing activity. (Author abstract by permission)

76-1640. Juszkiewicz, T.; Niewiadomska, A.; Radomanski, T. (Dep. Pharmacol. Toxicol., Inst. Vet., Pulawy, Poland). **Pozostalosci polichlorowanych dwufenyli w mleku kobiecym. [Polychlorinated biphenyl in mother's milk.]** *Pol. Tyg. Lek.* 30(44): 1821-1824; 1975. (12 references) (Polish)

The occurrence of polychlorinated biphenyls (PCB) was studied in the milk of women displaying no toxicological symptoms. Milk was taken from 104 women in childbed chosen at random within 4 days after delivery. They came from cities (66) and rural areas (38) and were 17-40 yrs old. PCBs were extracted from the milk with petroleum ether and acetone, chromatographically separated from polychlorinated insecticides, and quantitatively determined by gas chromatography (Pye-Unicam). PCBs were present in all samples at a conc. ranging from 0.01 to 1.40 ppm in the milk fat and amounting to 0.009 ppm in whole milk. In 45% of all cases examined, residue levels varied from 0.21 to 0.30 ppm; results were between 0.10 and 0.50 in more than 92%. No differences were found between urban and rural women. In a comparative study of PCB residues in the milk fat of women and cows, it was established that PCBs were three times higher and polychlorinated insecticides ten times higher in human milk.

76-1641. Jonczyk, H.; Rudowski, W.; Traczyk, Z.; Klawe, Z.; Arczynska, E. (Dep. Toxicol. Sanit., Nat. Inst. Hyg., Warsaw, Poland). **Dalsze badania nad zawartoscia DDT i jego metabolitow oraz beta i gamma HCH we krwi, szpiku, i tkance tluszczowej w niektorych zespolach hematologicznych. [Further investigations into the content of DDT and its metabolites as well as the beta- and gamma-BHC in the blood, bone marrow and adipose tissue in some hematologic disorders.]** *Pol. Tyg. Lek.* 30(46): 1909-1911; 1975. (9 references) (Polish)

A study was undertaken to determine the content of DDT and its metabolites and of β-BHC and γ-BHC (lindane) in the blood of 46 patients and in the bone marrow of 42 patients and compare it with levels in the blood and bone marrow of 15 healthy donors. These compounds were also determined in the adipose tissue of 32 individuals who died of various hematologic disorders and of 13 subjects who died due to other cases. Quantitative evaluation was performed by gas chromatography for DDT metabolites and BHC, using Dale's method for blood and Hamance's procedure for adipose tissue. The mean values of the compounds in adipose tissue of patients with disorders of the hematopoietic system and controls were about the same, but the level of DDT and *p,p'*-DDE in some cases was almost three times higher in the patients than in the controls. The average content of DDT in the blood of patients was also about three times higher than in the control group, but the results were not statistically significant.

76-1642. Kontek, B.; Glogowski, K.; Paradowski, S. **Zawartosc weglowodorow chlorowanych we krwi pracownikow rolnych zawodowo narazonych na dzialanie chemicznych srodkow ochrony roslin. [Chlorinated hydrocarbons in the blood of agricultural workers with occupational exposure to pesticides.]** *Pol. Tyg. Lek.* 31(7): 265-267; 1976. (8 references) (Polish)

Gas chromatographic analyses were made of several residues in 27 persons occupationally exposed to pesticides and in 16 control subjects. In the group of 27 exposed individuals the mean values for the residues analyzed were: γ-BHC (lindane) 11.0 μg/l; *p,p'*-DDT 18.6 μg/l; *p,p'*-DDE 59.9 μg/l; *p,p'*-DMDT (methoxychlor) 31.3 μg/l; and total DDT 84.1 μg/l. In the control group these values were 2.0; 10.6; 1.3; 16.8; and 28.7 μg/l, resp. In each case the difference was statistically significant.

76-1643. Traczyk, Z. (Hematol. Clin., Inst. Hematol., Warsaw, Poland). **Insektycydy polichlorowe i ich wplyw na uklad krwiotworczy. [Polychlorinated insecticides and their effect on the hematopoietic system.]** *Postepy Hig. Med. Dosw.* 29(4): 473-481; 1975. (24 references) (Polish)

The effects of polychlorinated insecticides, fungicides, and herbicides on the hematopoietic system of man is reviewed. These substances, including DDT and some BHC isomers, are thought to be harmful to the blood-forming tissues. Anyone consuming foodstuffs contaminated with these compounds is endangered. DDT and BHC concentrations in animal and vegetable products vary depending on the type of product and year of study. DDT accumulates in human adipost tissue, and is proportionate to the quantity consumed, inhaled, or absorbed via the skin. Its concentration is ten times higher in the liver and one hundred times higher in

adipose tissue than in blood. The permissible level set by WHO is 0.6 mg/day for DDT and 0.01 mg/day for BHC but is often exceeded. The most frequently described changes after exposure to DDT were aplasia of the bone marrow and thromobocytopenia following exposure via the respiratory tract. Contrary to the data of some researchers, others demonstrated an adverse effect on DDT on hematopoiesis, causing leukopenia, lymphocytosis, and inhibited erythrocyte formation. Even after 3 yrs, 30-40% of the initial quantity of DDT was still present in the adipose tissue, mostly metabolized into DDE. The results of the study gathered globally were contradictory, thus calling for further investigations with more reliable methods.

76-1644. Budoi, G. (Inst. Agron. N. Balcescu, Bucharest, Romania). **Aspecte ale poluarii solului.** [**Aspects of soil pollution.**] *Probl. Agric.* 26(3): 43-48; 1974. (6 references) (Romanian)

The deterioration of soils by accumulation of polluting substances through careless use of pesticides, fertilizers and irrigation water, and by deposition of radioactive dust and other matter is discussed in a review article. Useful herbicides may subsequently become harmful, as exemplified by high doses of atrazine, which are not toxic for corn plants but may damage successive wheat crops planted in the same soil. The residual action of fungicides and pesticides, as typified by DDT and other chlorinated hydrocarbons, results in their gradual accumulation, with consequent harmful effects in humans, animals, and plants. Although sparingly soluble in water, DDT can be transported by water to great distances from the site of application, thus contributing to the pollution of the environment. Boron accumulation is sometimes caused by careless use of herbicides. The controlling of soil pollution with methods made available by modern technology is advised.

76-1645. Wellenstein, G. (Lettenweg, Germany). **Biologische und oeko-toxikologische Probleme bei einer Flug-Begiftung unserer Waelder mit Derivaten der Phenoxyessigsaeure.** [**Biological and eco-toxicological problems regarding aerial application of phenoxyacetic acid derivatives in forests.**] *Qual. Plant. Pl. Foods Hum. Nutr.* 25(1): 1-20; 1975. (47 references) (German)

The importance of forests in the production of berries, mushrooms, nectar, and venison is demonstrated and the contamination of these foods by chemicals is proven. The planning and execution of chemical pest control therefore demands more attention to the recommendations of biologists and physicians. In this respect, control measures which have been used since 1970 on almost 8000 ha of German forest land are unsatisfactory. The effects of 2,4,5-T formulations on forest ecosystems are described, and results are given from residue analyses and nitrate determinations in 26 plant species. The unexpectedly high residual concentrations of slowly degraded herbicides present an acute danger to humans gathering berries and mushrooms, as well as to phytophagous animals. Growth regulating herbicides are also highly toxic to the honey bee (*Apis mellifera* L.), acting as both stomach and contact poisons. The application, particularly the aerial application, of such herbicides in the forest should be generally prohibited.

76-1646. Bencivenga, B.; Pallotti, G.; Botre, C.; Mancini, G. (Lab. Provinc. Ig. Profilassi, Rome, Italy). **Indagine su residui pesticidi cloro-organici in campioni di latte intero della "zona bianca" gcomune di Roma.** [**Organochlorine pesticides in whole milk samples from Rome's "white zone".**] *Rass. Chim.* 25(3): 271-274; 1973. (11 references) (Italian)

Forty-two of 138 milk samples were analyzed by treating 100 mg of each sample, previously homogenized, by the Onley method. Samples were compared to a standard containing heptachlor, aldrin, heptachlor epoxide, lindane, *p,p'*-DDE, dieldrin, *o,p'*-DDT, and *p,p'*-DDT. Only 2 samples did not contain detectable residues of organochlorine pesticides. The absence of aldrin and heptachlor is due to their oxidation in soil and to their being metabolized in the animal. Heptachlor epoxide is rarely present, or if so, is always in quantities undetectable by the usual analytical methods. However, it was detected in samples of commercial origin. For those pesticides present, the concentrations determined ranged from 0.001 ppm (sensitivity limit of the method) to 0.012 ppm in the worst cases. With a total average of 0.006 ppm, it can be seen that the samples contain organochlorine residues about 10 times lower than the maximum limit (0.064 ppm) established by the FAO/WHO. Even the limits for each individual pesticide were rarely reached or surpassed. Results suggest that the presence of pesticide residues is due more to basic pollution of the natural environment than to excessive use of these pesticides in agriculture.

76-1647. Sugaya, A.; Hayashi, S.; Meguro, Y.; Minagawa, N.; Sasaki, S.; Suzuki, Y.; Watabe, K. (Inst. Rural Med., Hiraga Gen. Hosp., Akita, Japan). [**Amount of organochlorine pesticide residues in human body.**] *Report of Studies Commissioned by Min. Health and Welfare 1974, Jpn. Soc. Rural Med.*, Vol. 1-2, 1976, pp 43-47. (Japanese)

Organochlorine pesticide residues (BHC, DDT, and polychlorocyclodienes) were determined in milk collected from mothers who gave birth in the authors' hospital from April 1 to May 31, 1974. Determinations were also performed on pieces of adipose tissue removed during operation, and in brain, liver, kidney, and spleen tissues collected during the same period. The organochlorine residue in the mothers' milk comprised 0.917-6.277 ppm of β-BHC (average 2.313 ppm on fat basis), 0.773-3.591 ppm of DDE (average 1.728 ppm on fat basis), and trace-1.723 ppm of *p,p'*-DDT (average 0.511 ppm on fat basis). These were all higher than those for 1973. In 8 specimens of

adipose tissue β-BHC amounted to 0.764-6.241, with an average of 2.991 ppm; DDE was 0.723-4.128 with average of 1.776 ppm, and *p,p'*-DDT was 0.068-7.032 ppm with average of 1.519 ppm. The content of β-BHC in organs and tissues was 2.744, 3.637, 0.591, 0.218, 0.104 and 0.112 ppm, respectively, in subcutaneous fat, greater omentum, kidney, liver, spleen, and brain. The DDT contents were 1.961, 1.900, 0.536, 0.197, 0.135, and 0.079 ppm in the above order. Residues were highest in the kidney and liver, of all organs examined.

76-1648. Kasai, A.; Asanuma, S.; Suzuki, A.; Ide, H.; Yokoyama, T.; Takayama, C.; Hagiwara, A.; Nakamura, S.; Kurosawa, K. (Author address not given). [**Studies on organochlorine pesticide residues in the human body, Part 5.**] *Report of Studies Commissioned by Min. Health and Welfare, 1974 Jpn. Soc. Rural Med.*, Vol. 1-2, 1974, 1976, pp. 48-55. (7 references) (Japanese)

Organochlorine pesticide residues in human tissues and organs obtained during surgery or autopsy were determined in 1975. The findings revealed that at present, five years after the ban of organochlorine pesticides, the highest contents of total BHC, total DDT, and dieldrin were 18.651, 35.328, and 0.935 ppm (fat basis) in the whole body. The average contents of β-BHC and *p,p'*-DDE were higher than those in 1974, probably due to pollution of the diet and the environment. The residual amount of total BHC and total DDT was higher in men than in women, BHC was higher in younger people, and DDT was higher in older people. Accumulation of residues was richer in subcutaneous fat and in the mesentery, but *p,p'*-DDT levels were high in the kidney. The residual amount in body fat was generally higher than the average in patients with cerebral apoplexy, renal failure, myasthenia, bile duct cholelithiasis, uterine myoma, stomach cancer, and stomach ulcer.

76-1649. Takamiya, T.; Uchida, A. (Inst. Environ. Epidemiol., Fac. Med., Chiba Univ., Chiba, Japan). [**Organochlorine pesticide residues in human placenta and blood.**] *Report of Studies Commissioned by Min. Health and Welfare, 1974 Jpn. Soc. Rural Med.*, Vol. 1-2, 1976, pp. 57-59. (4 references) (Japanese)

Organochlorine pesticide residues were determined in 10 samples of placental blood at the time of delivery and in umbilical cord blood in the spring of 1975. Similar determinations were carried out on blood samples from 20 fasting rural women in the suburbs of Chiba City. All the determinations at the time of delivery showed β-BHC and *p,p'*-DDE in the blood of the placenta, of the mother, and of the umbilical cord. The average content of β-BHC was 1.9, 5.7, and 6.8 ppb in umbilical cord, mother, and placenta. The contents of *p,p'*-DDE were 1.5, 5.5, and 4.3 ppb in the above order. As is seen, the levels of the 2 compounds in placental blood were about 30% that in the maternal circulation, showing a high correlation between the two. All the rural women's blood contained β-BHC and *p,p'*-DDE. The contents of the two compounds were similar, but were not definitely correlated. Traces of dieldrin were found in the mothers' blood, placental blood, and some of the rural women's blood, but only close to the detection limit, at most 1 ppb. No dieldrin was detected in umbilical cord blood.

76-1650. Asanuma, N.; Suzuki, A.; Kurosawa, K. (Nippon Inst. Rural Med., Saku Gen. Hosp., Usuda, Nagano, Japan). [**Experimental studies on organophosphorus pesticide residues in living bodies. Part 2.**] *Report of Studies Commissioned by Min. Health and Welfare, Jpn. Soc. Rural Med., 1974*, Vol. 1-2, 1976, pp. 60-66. (6 references) (Japanese)

Experiments were carried out on rhesus monkeys and male Wistar rats. After oral administration of fenitrothion in a single dose at 2 mg/kg (injected into bananas) blood was collected 3 and at 9 hr and at one, 2, 5, and 20 days. The residue level of fenitrothion in blood showed a peak at 9 hr-one day, and then declined to trace levels by the fifth day. The urinary metabolites were almost all excreted within one to two days. Serum ChE activity and erythrocyte ChE activity showed reductions of 30% and 10%, respectively; however, the decline in the former was not reversed even after 5 days. In the rats, fenitrothion, formulated fenitrothion, and fenitrothion plus dichlorvos were administered p.o. at 30 mg (fenitrothion)/kg. The rats were sacrificed after 3 hr, and one, 5, 15, and 30 days. The residues in the blood and the organs showed a peak at 3 hr - one day, then declined slowly. When the residues of fenitrothion emulsion and fenitrothion plus dichlorvos were compared in the brain, the former case showed higher residues after one and 5 days, due to the effect of emulsifier. This fact was supported by the greater reduction of ChE activity and the slow rate of excretion into the urine.

76-1651. Aizicovici, H.; Cocisiu, M.; Unterman, H. W.; Nistor, C.; Barbuta, R.; Gugles, E. (Inst. Sanat. Pub., Cercet. Med., Iasi, Romania). **Studiul corelatiei dintre poluarea alimentelor cu pesticide si nivelul de impregnare a organismului cu aceste substante.** [**Study of the correlation between food pollution with pesticides and the impregnation level of the organism with these pesticides.**] *Rev. Med.-Chir.* 78(2): 377-382; 1974. (13 references) (Romanian)

Studies were made of the DDT+DDE and HCH (BHC) contents in 600 samples of food taken on one day from families in rural areas or from diets of women admitted to a maternity institute. Samples were also taken from 723 human adipose tissue samples and 367 mothers' milk samples. Organochlorine insecticide residues were found in a high proportion of the food samples, up to levels exceeding the maximum permissible limits. The levels of DDT and BHC found in the human samples were higher than those reported in other countries, reflecting the higher concentrations in the diets. It is suggested that the use of DDT and BHC in agriculture be reduced and that other, less persistent pesticides be used instead.

76-1652. Zurawski, H.; Szumilak, G.; Ploszynski, M. (Dep. Soil Plant Cultivation, Laskowice Olawskie, Poland). **Zastosowanie metod biologiznych do badan nad detoksykacja symazyny w glebie lekkiej w warunkach polowych. [Application of biological methods to investigations on simazine disappearance on light soil under field conditions.]** *Rocz. Glebozn.* 24(2): 331-341; 1973. (16 references) (Polish)

The disappearance was studied of simazine in light soil under field conditions. Simazine was sprayed in 1965 and 1966 at the rates of 1.5, 5.0, 10.0, and 25.0 kg/ha a.i. Using biological bioassay, cup and half-cylinder methods, the investigations were carried out. Soil samples were taken monthly during the growing season. When simazine was applied at the rate of 1.5 kg/ha a.i. it disappeared within one growing season. At the rate of 5.0 kg/ha it disappeared within one year, while higher rates persisted into the second year. The preparation was strongly adsorbed in the layers 0-6 cm and even 6-10 cm of soil profile, penetrating to a lesser degree into deeper layers. The cup bioassay method was suitable for estimating dynamics of herbicide disappearance from the soil. The half-cylinder method was useful in determining herbicide penetration into the soil.

76-1653. Smoczynski, S. (Inst. Phys. Chem. Instytut Fizyki I Chemii Zywonosci, Olsztyn, Poland). **Chlorowane weglowodory w serach dojrzwajacych. I. Sery: edam, tilsit, rokpol. [Chlorinated hydrocarbons in ripening cheeses. I. Edam, Tilsit, and Rokpol.]** *Rocz. Inst. Przem. Mlecz.* 15(3/4): 37-49; 1973. (20 references) (Polish)

Changes in the content of chlorinated hydrocarbons and metabolites in ripening Tilsit, Edam, and Rokpol cheeses were discussed. It was found that their concentration in processed milk fat was about the same as in the fat of the cheese mass. The conclusion could be drawn that as ripening progressed, the contents of all chlorinated hydrocarbons, particularly DDT, decreased. These changes were statistically insignificant, but there was a trend toward reduced insecticide content (α- and γ-BHC) during the ripening of Tilsit and Rokpol cheeses. In the case of Edam cheese, the mean content of α- and γ-BHC was the same in the fat of the fresh cheese and that of the cheeses ripening over a period of 12 wk. The total of DDT, DDD (TDE), and DDE also displayed a tendency toward reduction during the ripening period. This tendency could be the result of biodegradation of the compounds in the aqueous phase of the cheese, but no substantial changes actually occurred.

76-1654. Singhal, J. P.; Kumar, D. (Chem. Lab., Fac. Eng. Technol., Muslim Univ., Aligarh, India). **Adsorption of telone on kaolinite: Part 1.** *Soil Sci.* 121(3): 156-161; 1976. (14 references)

The nature and mechanism of adsorption and interaction between the pesticide telone (1,3-dichloropropene) and the clay mineral kaolinite in its acid and base saturated form were studied. The adsorption of telone on H- and Na-saturated kaolinite suspensions in the equilibrium concentration range of 0-1.8 m*M* telone/liter yielded class "H" isotherms. Rapid initial adsorption suggested chemisorption of the nematocide as a cation exchange reaction. The data did not agree with the Langmuir equation, although adsorption in excess of the cation exchange capacity suggested a possible van der Waals interaction over the chemisorbed layers. No desorption of the pesticide occurred on treatment of the complexes with inorganic salts. There were marked pH and electrical conductivity changes during the interaction, and a reaction mechanism for the chemisorption of the nematocide on acid and base saturated kaolinites is proposed. X-ray diffraction and IR spectroscopy supported interaction of the pesticide at the edge surface of the kaolinites.

76-1655. Selim, H. M.; Mansell, R. S.; Elzeftawy, A. (Soil Sci. Dep., Univ. Florida, Gainesville, FL 32611). **Distributions of 2,4-D and water in soil during infiltration and redistribution.** *Soil Sci.* 121(3): 176-183; 1976. (22 references)

A numerical model was developed to predict transient water and reactive solute transport in water-unsaturated soil. An implicit-explicit method of finite difference approximation was used to simultaneously solve the water and solute flow equations. The model was then used to calculate the transport of water and 2,4-D in a field profile of Lakeland fine sand during infiltration at constant intensities (2.08 and 4.10 cm/hr). The calculated values of the soil-water distributions compared well with experimental determinations, but agreement obtained between 2,4-D distributions was only adequate. Simulated results were also obtained to study the effect of irrigation intensity on water and herbicide transport during redistribution following irrigation. For advanced stages of redistribution, solute movement became negligible and the maximum herbicide concentration was located at the same depth in the soil profile regardless of irrigation intensity.

76-1656. Barraquejo, M. J. C.; Furman, D. (Dep. Quim., Ist. Nac. Farmacol. Bromatol., Min. Bienestar Social, Buenos Aires, Argentina). **Determinacion de residuos de plaguicidas clorados en manzanas de Rio Negro. [Determination of chlorinated pesticide residues in Rio Negro apples.]** *Tecnol. Aliment.* 7(37-38): 15-17; 1973. (4 references) (Spanish)

Red Delicious apples grown in the Rio Negro Valley were analyzed for the presence of pesticide residues. Tests were conducted on washed whole apples, unwashed whole apples, and the skin and pulp. Gas chromatography according to the method of Mills was applied. Approximately 80% of the samples showed traces of DDT; 40% had values up to 0.2 ppm and 2-3% greater than 1 ppm. BHC and lindane residues were found in approximately 75% of the samples, ranging from trace amounts up to 0.05

ppm. Only about 30% of the samples had DDE residues at values ranging up to 0.2 ppm. The values quoted are below the Argentine legal tolerance limits of 7 ppm for DDT and 2 ppm for lindane. No maximum limits have been determined for BHC or DDE. Separate testing of skin and pulp revealed that the contamination was concentrated in the skin. No significant differences were noted between washed and unwashed apples.

76-1657. Heurteaux, P.; Mestres, R.; Vaquer, A. (Cent. Ecol. Camargue, Arles, France). **Contamination des milieux aquatiques Camarguais par les residus de produits phytosanitaires. [Contamination of the aquatic environment of the Camargue by pesticide residues.]** *Terre Vie* 27(1): 33-61; 1973. (9 references) (French)

Results of a two-year study indicate that the agricultural techniques used, especially in rice-growing (intensive and extensive irrigation, chemical control of pests) threaten to pollute the whole aquatic environment in the Camargue, especially the lakes located in the "Reserve Naturelle Zoologique et Botanique". The pollutants come from the Rhone and from agricultural treatments which use herbicides and insecticides. Herbicide studies have yielded data too fragmentary to lead to valid interpretations. Insecticide studies indicate that water pollution is still very low but that the accumulation of organochlorines at the various trophic levels of the ecosystem is a real threat. The pesticides most frequently found are alpha-BHC and γ-BHC (lindane). Detectable doses of DDT were less frequently recorded. Other residues are only suspected to be in water because of their presence in animal tissues (dieldrin). Others are only detected at the time of treatment of crops (organophosphates and especially parathion) or as a result of very specific circumstances (polychlorocamphene). The presence of polychlorobiphenyls in the environment is of special concern. They are probably of mixed origin (the Rhone and commercial formulations of agricultural pesticides). They are very stable and accumulate at relatively high rates in sediments as well as in aquatic plants and animals. The conciliation of agriculture and nature conservation in the Camargue depends on the return into the Rhone of all crop run-off water that is presently being discharged into the Etang du Vaccares and on research on cultural methods which will produce less pollution than those presently in use.

76-1658. Ermolenkov, V. V.; Slizhevskaya, I. A. (Author address not given). **Ostatochnoe kolichestvo nekotorykh gerbitsidov v vyrashchivaemoy produktsii. [Herbicide residues in crops.]** *Tr. Beloruss. Sel'sk. Akad.* (113): 75-77; 1973. (5 references) (Russian)

The effect of the use of different herbicides was studied on residues in crops of winter rye and in potato tubers. Winter rye was treated with 2,4-D (0.6-114 kg/ha), MCPA (0.8-1.8 kg/ha), and MCPB (1.5-2.5 kg/ha). After treatment with 1.4 kg/ha doses of 2,4-D and with a 2.5 kg/ha dose of MCPP rye plants contained 0.23 mg/kg 2,4-D and 0.12 mg/kg MCPB, respectively, but other samples contained no detectable quantities of herbicides. Rye grains were free from residues. After treatment with Komparol (containing 15% simazine and 40% prometryne) at doses of 1 and 1.5 kg/ha, potato tubers contained 0.1 and 0.2 mg/kg residue, respectively. Tubers from tomato plants treated with 0.5 kg/ha doses of Komparol or with 1.5 kg/ha doses of Gesapax (containing 50% ametryne) were free from residues.

76-1659. Shushu, G. E. (Author address not given). **Izuchenie posledeystviya gerbitsidov v usloviyakh orosheniya. [Residual effects of herbicides under irrigation conditions.]** *Tr. Kishinev. Sel'sk. Inst.* 99: 77-84; 1973. (7 references) (Russian)

The effects of zeazin (atrazine, 0.5-2.5 kg/ha), simazine (3 kg/ha) and a combination of simazine with 2,4-D sodium salt on the growth of corn, oat, and winter wheat plants and on herbicide residues in the soil were studied under irrigation conditions and in laboratory biological tests. Soils in which corn plants were treated with atrazine (3 kg/ha) contained 1.5 kg/ha atrazine in the upper 20 cm-layer and 0.5 kg/ha in the 20-40 cm horizon at the end of the vegetation period. When a 1.5 kg/ha dose of atrazine was combined with 2,4-D (1.3 kg/ha), the atrazine level in the upper 20 cm layer was less than 0.5 kg/ha, and only traces of atrazine were found in the 20-40 cm horizon at the end of the vegetation period. Simazine was found to have lost its activity after 7 years' storage.

76-1660. Fassbender, H. W. (Soil For. Nutr. Inst., Goettingen Univ., Germany). **Contenido y formas de arsenico en algunos suelos tropicales. [Content and forms of arsenic in certain tropical soils.]** *Turrialba* 25(1): 11-18; 1975. (13 references) (Spanish)

Due to the scarcity of data on the subject, the content of arsenic (As) and its various forms was investigated in normal soils from Colombia, Costa Rica, and Puerto Rico, and in Costa Rican soils after contamination with lead arsenate. The content of phosphorus (P) was also determined for comparison purposes. The analyses were carried out by the ammonium arsenomolybdate and ammonium phosphomolybdate methods. The results showed a higher average concentration of total As (11.03 ppm) and lower P (690 ppm) in the Colombian than in the Costa Rican soils (5.09 ppm As; 1188 ppm P). The Puerto Rican soils showed similar contents, with an average of 10.03 ppm As and 389 ppm P. The various forms of As were determined by the same methods in the Bayamon and Koto series of Puerto Rican soil only. The results showed higher levels of calcium than of aluminum and ferrous arsenites, with total average As percentages of 9.95, 2.05, and 1.75, respectively. Coffee-growing soils of Costa Rica treated with lead arsenate as a pesticide (7 kg/ha in the last 7 yr.) and sampled at different depths showed a superficial layer increase in total As from 10.6 to 49.0 ppm at 0.5 cm

depth and from 11.3 to 27.4 ppm at 5-15 cm. High accumulations (from 113 to 145 kg/ha found in the lower levels, to 80 cm in depth) appear to have been caused by treatments applied before the 7 years included in the evaluation. The ferrous salt (12.2 kg/ha) was prevalent, followed by the calcium (2.2 kg/ha) and aluminum salts (1.8 kg/ha). The authors conclude that As and P possess little mobility and accumulate only in the superficial layers of the soil. The presence of Al, Fe and Ca ions in the soil, however, can yield As compounds with unknown availability to and utilization by the plants.

76-1661. Highland, H. A.; Secreast, M. (Stored-Prod. Insects Res. Dev. Lab., Southern Region, Agric. Res. Serv., USDA, Savannah, GA). **Barriers in synergized-pyrethrins-treated paper bags to prevent migration of piperonyl butoxide into cornmeal, flour, and CSM.** *U.S. Dep. Agric., Tech. Bull.* No. 1475, 1973, 14p. (5 references)

The effects of insecticide barriers in synergized-pyrethrins-treated, insect-resistant multiwall paper bags were studied. The migration of piperonyl butoxide from the outer treated ply of bags having various barriers and containing flour, cornmeal, or CSM (a cereal consisting of corn meal, soy flour, dry milk, vitamins, and minerals) was measured. Eight saran-coated kraft barriers having styrene-butadiene (SB) or polyethylene (PE) precoats, one PE-coated, and two polyvinyl alcohol (PVA)-coated kraft barriers, and glassine and grease-proof paper barriers were used in the study. Testing was also performed on experimental synergized pyrethrins/wax coatings. Several conclusions were drawn from this study. An effective barrier ply is required to prevent the occurrence of excessive residues of piperonyl butoxide in flour, cornmeal, and CSM stored in 25-pound, synergized-pyrethrins-treated kraft bags. Grease-proof paper was the best barrier of those tested. The SB/saran-coated kraft was almost as effective as the grease-proof paper. PE/saran-coated kraft was much less effective. Light coatings of PE and PVA were ineffective and in some cases promoted movement of piperonyl butoxide into the contents of the bags. The biological effectiveness of the coatings was not extended by increasing the amount of synergized pyrethrins in the insect-resistant-treated coatings. The bags which contained flour were much more susceptible to insect attack than were bags of CSM or cornmeal. The movement of piperonyl butoxide was faster in bags containing CSM than in cornmeal or flour. Also the extent of movement was greater in CSM than in cornmeal or flour. Two coatings of saran over SB or PB formed a better barrier against the migration of piperonyl butoxide than did a single coat. The saran-coated barrier plies absorbed and held the piperonyl butoxide. The existence of large numbers of pinholes in the saran coatings did not greatly decrease the effectiveness of the coatings as barriers to the migration of piperonyl butoxide.

76-1662. Westoo, G.; Andersson, A.; Mattsson, S. (Statens Livsmedelverk, Stockholm, Sweden). **Antimoegelmedel i citrusfrukter, aepplen och paeron, mars 1972—januari 1974. [Fungicides in citrus fruits, apples, and pears, March 1972—January 1974.]** *Var Foeda* 26(1): 2-18; 1974. (4 references) (Swedish)

The levels of biphenyl, *o*-phenylphenol, and thiabendazole were determined in 630 samples of citrus fruits purchased in retail shops. Samples from Italy, Spain, Morocco, and Swaziland were generally free from biphenyl, but some samples contained *o*-phenylphenol or thiabendazole. Certain samples from non-European countries did, however, have high biphenyl levels. About 8% of the non-European oranges, primarily Israeli, exceeded the Swedish tolerance limit (110 mg/kg) for biphenyl, and a few clementines and mandarins from Australia also exceeded the limit. The tolerances for *o*-phenylphenol (10 mg/kg) and thiabendazole (6 mg/kg) were exceeded by one clementine each, and two of 34 oranges contained benomyl. Almost all of the biphenyl was contained in the peel, which might cause a problem when the peel is used to prepare syrups; biphenyl levels in the syrup can, however, be reduced by cutting the peel into strips rather than grinding or grating it. Apples and pears (about 50 samples of each) contained no fungicide or only low levels.

76-1663. Todorov, D.; Yotov, Y.; Sergeyeva, D. (Vet. Inst. Infect. Parasit. Dis., Sofia, Bulgaria). **Vurkhu preminavaneto i zadurzhaneto na nyakoy pestitsidi v byaloto salamureno sirene i kaskhavala prerabotka na mlyakoto. [Elimination and retention of some pesticides in white brine cheese and yellow cheese in the processing of milk.]** *Vet. Med. Nauki* 11(1): 95-100; 1974. (8 references) (Bulgarian)

The elimination and retention of pesticides in white brine cheese and yellow cheese (Kashkaval) were studied during the processing of milk containing residual amounts of DDT, BHC, lindane, methyl parathion, and sevin (carbaryl). The persistence of the residues was followed during the process of ripening and storage of cheese under warehouse conditions. The results of this study allow the following conclusions. Pasteurization of milk at 68°C for 10 min during the production of white brine cheese partly destroys the pesticide residues. DDT proved to be the most stable, followed by sevin and lindane, at 98, 95, and 93%, resp. The pesticides pass into the curd and whey during the processing of milk into white brine cheese and kashkaval. Organochlorine pesticides mostly concentrate in the curd, which contained up to 89.17% and 89.51% of DDT and lindane, respectively, of the total amounts passed from the milk. One kilogram of cheese contained 40 times more DDT and 40.6 times more lindane than did one liter of whey. Organophosphate and carbamate pesticides chiefly passed into the whey, which contained 97.03% of the neguvon (trichlorfon) and 92.68% sevin out of the total amounts of pesticides present in the curd and whey. DDT persisted in the white brine cheese up to 12 months, lindane and methyl parathion up to 7 months, and neguvon up to the 5th month.

76-1664. Rachev, R.; Yotov, Y.; Sergeyeva, D. (Sci. Res. Inst. Milk Processing, Vidin, Bulgaria). **Opiti za**

namalyavane na organokhlornite pestsidi v mlyakoto i mlechnite produkti. I. Suobshcheniye. [**Attempts to lower the amounts of chlorinated organic pesticides in milk and dairy products. Part I.**] *Vet. Med. Nauki* 11(5): 87-92; 1974. (9 references) (Bulgarian)

Several methods for reducing the amounts of chlorinated organic pesticides in milk and milk products were investigated. The methods studied included heat treatment at 93°C and 100°C, vacuum evaporation, spray drying, ultraviolet irradiation, and chemical treatment with hydrogen peroxide and benzoyl peroxide. The results of this study indicate that heat treatment is not sufficient to lower the organochlorine pesticide concentration in milk. The use of vacuum evaporation and spray drying of the product produce better results. Ultraviolet treatment was effective only with regard to the DDT pesticide group, which declined by about 60 - 65%. Benzoyl peroxide was not effective as an oxidizing agent for chlorinated organic pesticides. The best results, a decrease of up to 43.7% for α-BHC and up to 47.1% for *p,p'*-DDT, can be obtained by treatment with hydrogen peroxide at concentrations of 0.3% in milk at room temperature for 15 min.

76-1665. Leistra, M.; Smelt, J. H.; Verlaat, J. G.; Zandvoort, J. (Lab. Res. Insectic., Wageningen, The Netherlands). **Measured and computed concentration patterns of propyzamide in field soils.** *Weed Res.* 14(2): 87-95; 1974. (12 references)

The persistence of propyzamide in soil was studied by analyzing soil samples taken at intervals two or three times after application in the spring to experimental fields. Single samples were taken from other fields, 8 to 12 months after autumn application. The concentrations were measured by electron-capture gas chromatography. Persistence is expressed in first-order dissipation rate constants and half-life values. Data were measured and collected on the adsorption of propyzamide on soils, the soil characteristics, and the weather conditions. Computations of the mobility of propyzamide in soil were carried out for simplified systems. Results of measurements and computations are compared. (Author abstract by permission)

76-1666. Baldwin, F. L.; Santelmann, P. W.; Davidson, J. M. (Ext. Agron., Arkansas Agric. Ext. Serv., Little Rock, AR 72203). **Prometryn movement across and through the soil.** *Weed Sci.* 23(4): 285-289; 1975. (18 references)

Specially constructed runoff plots were used to study the effect of simulated rainfall intensity, antecedent soil moisture, and subsequent rainfall on prometryn [2,4-bis (isopropylamino)- 6-methylthio- *s*-triazine] movement across and through a field soil with a 1% slope. The first cm (45.4 l) of runoff was collected and subdivided. The initial 3.8 l of runoff water generally contained a higher concentration of prometryn than did a composite from the next 41.6 l. The sediment contained a higher prometryn concentration than did the runoff water. However, due to the greater volume of water lost compared to sediment, over 90% of the prometryn lost was in the water fraction. When prometryn was applied to a dry soil and rainfall simulated, runoff losses of prometryn were 0.5% or less of the total amount initially applied. The first runoff producing simulated rainfall caused the largest prometryn losses, but prometryn could not be detected in the runoff one month subsequent to application. Prometryn runoff was greater from plots in which the soil was wet at the time of application. (Author abstract by permission)

76-1667. Sharom, M. S.; Stephenson, G. R. (Dep. Environ. Biol., Univ. Guelph, Guelph, Ontario, Canada). **Behavior and fate of metribuzin in eight Ontario soils.** *Weed Sci.* 24(2): 153-160; 1976. (19 references)

The adsorption, desorption, and mobility of metribuzin [4-amino-6-*tert*- butyl-3-(methylthio)- *as*-triazine-5(4H)one] in eight Ontario soils were investigated. The distribution coefficients varied from 0.56 for the least adsorptive Fox sandy loam soil to 31.67 for the most highly adsorptive Leamington muck soil. Most of the adsorbed metribuzin was desorbed from the mineral soils after six aqueous extractions, however, substantial amounts of the herbicide remained adsorbed on the muck soils after 10 aqueous extractions. The herbicide was relatively mobile in mineral soils but was immobile in the muck soils. Mobility was inversely correlated with the amount of soil organic matter. Bioassay studies indicated that phytotoxicity of metribuzin also decreased with increasing organic matter content of the soil. Persistence of metribuzin was dependent on microbial degradation. In a field study with Guelph loam, the half-life of metribuzin was approximately 3 months. (Author abstract by permission)

76-1668. Nalewaja, J. D.; Adamczewski, K. A. (North Dakota State Univ., Fargo, ND 58102). **Vaporization and uptake of atrazine with additives.** *Weed Sci.* 24(2): 217-223; 1976. (12 references)

The loss of atrazine [2-chloro-4- (ethylamino)-6-(isopropylamino)- *s*-triazine] from metal planchets was decreased by an increase in the amount applied and linseed oil (LO) additive. LO reduced volatility to a greater extent than did other additives. Vapor loss from plant leaves was influenced by plant species, plant leaf maturity, soil moisture, concentration of atrazine applied, volume of oil additive, type of additive, and duration of exposure. Generally, atrazine uptake by plants was inversely related to volatility. Uptake and translocation of ^{14}C-atrazine label was increased more by oil additives than surfactant (SURF) compared to no additive. LO increased ^{14}C-label translocation more in yellow foxtail [*Setaria glauca hutescens* (Weigel) Hubb.], green foxtail [*Setaria viridis* (L.) Beauv.], and barnyardgrass [*Echinchloa crus-galli* (L.) Beauv.] than in corn (*Zea mays* L.) (Author abstract by permission)

76-1669. Kreuzer, W. (Tieraerztl. Fak., Univ. Munich, Munich, Germany). **Milchhygiene aus heutiger Sicht unter besonderer Beruecksichtigung des Rueckstandsproblems.** [**Milk hygiene in the light of present knowledge with particular reference to the problem of residues.**] *Wien. Tieraerztl. Monatsschr.* 61(2): 57-66; 1974. (54 references) (German)

This paper discusses problems encountered in the field of milk hygiene in relation to animal health and technological practices of milk handling and processing. Information on residues in milk and milk products forms the major impact of the article. A critical review of potential and actual human health hazards resulting from these residual substances is presented. In the course of this study the following amounts of the indicated pesticides were found in milk and milk products: α-BHC, none: lindane, 0.0050 ppm; heptachlor and heptachlor epoxide, 0.0033 ppm; aldrin and dieldrin, 0.0038 ppm; total DDT, 0.0210; and HCB, 0.0039 ppm. The results of this study indicate that the residues in milk and milk products are not considered to present toxicological problems for healthy adult humans. However, the problem of residues in these foods has reached a critical stage with regard to infants, children and sick persons.

76-1670. Lang, K. (Physiol. Chem. Univ.-Inst. Mainz, 7812 Bad Krozingen, Germany). **Differente Substanzen in Lebensmitteln.** [**Extraneous substances in foods.**] *Z. Ernaehrungswiss. Suppl.* 16: 95-110; 1973. (German)

Studies on the presence and possible harmful effects of toxic proteins and peptides, goitrogenic and lathyrogenic substances, glycosides, pyrroziline derivatives, oxalic acid, fluorine, selenium, heavy metals, biogenic amines, mycotoxins, radioactive isotopes, nitrosamines, and pesticides in foods are reviewed. While some 300 different pesticides are currently in use, and most of them are persistent, food contamination with pesticide residues is mainly due to a few, such as carbaryl, DDT, DDE, TDE, dicofol, malathion, dieldrin, lindane, pentachlorophenol, aldrin, diazinon, heptachlor, and heptachlor epoxide. The ADI has been set at the 0.1 mg/kg/day level for captan and methoxychlor, at 0.02 mg/kg/day for carbaryl and malathion, at 0.0125 mg/kg/day for lindane, at 0.01 mg/kg/day for DDT, at 0.005 mg/kg/day for parathion, at 0.002 mg/kg/day for diazinon, at 0.001 mg/kg/day for chlordane and phosphamidon, at 0.0005 mg/kg/day for heptachlor, and at 0.0001 mg/kg/day for aldrin and dieldrin. The average daily pesticide intake for the US population has been calculated to be 1.3 μg/kg for organochlorine pesticides, 0.13 μg/kg for organophosphorus pesticides, and 1.3 μg/kg for all herbicides combined. Chemical transformations occurring in soil, plants, and animals, as well as during storage, processing, and culinary preparation can reduce the residue levels more or less considerably.

76-1671. Nalbandyan, R. A. (Azerbaijan Inst. Plant Protection, USSR). **O sokhranenii sevina i fozalona v pochve.** [**Persistence of sevin and phosalone in the soil.**] *Zashch. Rast. (Moscow)* 3: 26; 1974. (Russian)

The persistence and migration of carbaryl and phosalone were studied in the soil at different times after spraying vineyards with a 0.3% suspension of carbaryl or a 0.2% suspension of phosalone at a rate of 1,000 liter/ha. Carbaryl penetrated to a maximal depth of 50-60 cm, where it was detectable for up to 15-20 days. Phosalone penetrated to a maximal depth of 30-40 cm, where it was detectable for 20-25 days. The carbaryl concentration in the upper 5 cm layer of the soil gradually increased from 0.48-0.86 to 0.65-1.13 mg/kg during the first days after treatments. For phosalone, this increase was from 0.22-0.92 to 0.40-0.97 mg/kg. A carbaryl concentration of 0.10 mg/kg was fbund in the upper culture layer at the end of the vegetation period, at which time no phosalone was detectable. The findings indicate fairly rapid penetration of carbaryl and phosalone into the deep layers of the soil.

76-1672. Motuzinskiy, N. F.; Zvorykina, L. B. (VNIIGINTOKS, USSR). **Razlozhenie butilovogo efira 2,4-D.** [**Decomposition of 2,4-D butyl ester.**] *Zashch. Rast. (Moscow)* 3: 51; 1974. (Russian)

The degradation of 2,4-D butyl ester was studied in soil, plants, and berries after aerial application of the arboricide over a forest. Most of the pesticide was retained by the foliage. On the day of the treatment, the pesticide level in the topsoil was 4.6 times higher in open glades than it was under trees. However, the degradation was much faster in glades than under trees, and the residue found in glades 10 days after treatment was 5.5 times lower than that found under trees. Traces of 2,4-D butyl ester were found at the 10-20 cm depth 10 days after treatment. No residues were found in mushrooms on the 10th day.

See also **76-1701 76-1766 76-1793 76-1809 76-1816 76-1844 76-1857**

76-1673. Freidenberg, I.; Riera de Martinez, N. L. (Forensic Medicine Institute, Tucuman, Argentina). **Aspectos mediocolegales toxicologicos de los plaguicidas en Tucuman. [Forensic-toxicological aspects on pesticides in Tucuman, 1968-1970.]** *Jornadas Argent. Toxicol. Anal. Actas* 1: 72-77; 1971. (Spanish)

On the basis of three years of collaboration with the police department of the Argentine province of Tucuman, during which 96 pesticide cases were studied, the authors have made a series of ten statements which include the following data: poisoning due to pesticides in Tucuman has increased considerably in the last 3 years. Organophosphorus and other pesticides have been used for criminal activities and suicides. Pesticide problems have caused labor unrest. Occupational pesticide poisoning should be indemnified in accordance with Argentine law 9,688. Occupational exposure to pesticides should be limited to six hours per day, blood levels of cholinesterase should be monitored, a minimum age level should be set, and pregnant and nursing mothers and those with respiratory and skin diseases should be excluded. Items subject to criminal contamination with pesticides are water sources, carbonated beverages, wine, medicines, and baby formulas.

76-1674. Data, O. (C.A.T. Toxicology Consultation Center, Municipal Emergency Hospital, Cordoba, Argentina). **Nuestra experiencia en intoxicaciones agudas por plaguicidas. [Personal observations of acute pesticide poisoning cases.]** *Jornadas Argent. Toxicol. Anal. Actas* 1: 78-84; 1971. (Spanish)

From records kept at the Toxicology Center in Cordoba (Argentina) since July, 1967 the number of poisoning cases attributable to pesticides has been on the increase. Of a total of 1,425 cases, 163 were from pesticides, of which 86 were of the male sex, accidental causes accounting for 111 cases, suicides for 50, and homicides for one. Chlorinated pesticides were involved in 95 cases, inorganic chemicals (thallium, cyanides, arsenic, etc.) in 46, organophosphates in 18, and botanicals in 4. In the organophosphate group, three deaths were caused by parathion. All pesticide poisonings in children of preschool age were accidental. The largest group of suicidal patients were girls between the ages of 14 and 16. In the treatment of organophosphate poisoning, care must be taken to continue treatment for a sufficiently long period, since deaths have sometimes occurred from premature discontinuation. Singular success was experienced in the use of chlorpromazine to control hyperexcitability in the patient.

76-1675. Wurster, C. F. (State Univ. New York, Stony Brook, NY). **More about DDT.** *J. Am. Med. Assoc.* 231(5): 463-464; 1975. (8 references)

After 7 months of comprehensive hearings, the Environmental Protection Agency concluded that any benefits provided by DDT were greatly outweighed by its costs, and DDT was banned in 1972. DDT has been proven carcinogenic in laboratory animals, and authorities on chemical carcinogenesis have interpreted the results of the animal experiments to indicate that DDT is a cancer hazard for man. It is extremely difficult to identify substances that cause cancer in man because it is not possible to experiment with human beings. The problem of proving a carcinogenic potential in humans is even greater with DDT than with many other substances since everyone is exposed and there is no control population available for comparison with an exposed population. DDT is still of benefit for malaria control in a few poor countries that cannot afford alternative methods. But in the United States, DDT is neither needed nor used for disease vector control. Prior to its ban, the major use of DDT was on cotton, and substantial evidence indicates that in that capacity DDT was actually counterproductive.

76-1676. Simon, F. A.; Pickering, L. K. (Dep. Pediatr., Program Infectious Dis. Clin. Microbiol., Univ. Texas Health Sci. Cent., Houston Med. Sch., Houston, TX). **Acute yellow phosphorus poisoning: "smoking stool syndrome."** *J. Am. Med. Assoc.* 235(13): 1343-1344; 1976. (8 references)

Acute phosphorus poisoning was diagnosed in a 3-yr-old girl, a 2-yr-old boy, and a 7-yr-old boy. The children were hospitalized following the ingestion of unknown quantities of rat poison containing 2.5% inorganic phosphorus. The first two patients showed no spontaneous movements but were responsive to painful stimuli. The abdomen was soft, and the breath, gastric aspirate material, and stool smelled of garlic. Both children passed black smoking stools and both died within hours of pesticide ingestion as a result of cardiopulmonary arrest. The third child appeared in no distress, but the gastric aspirate material contained 6.4 mg/100 ml phosphorus and smelled of garlic. The patient remained asymptomatic during a 3-day stay in the hospital and recovered normally. Treatment in cases of acute phosphorus poisoning should be aimed at protecting patient and attendants from contact with the phosphorus, removal of the poison, and general supportive measures to maintain vital functions and combat shock. A recent alarming increase in the incidence of phosphorus poisoning following the ingestion of rat poison may be an indicator of widespread usage and greater occurrences of poisoning in the future. The phosphorus-containing rat pastes should be eliminated from the market.

76-1677. Hussey, H. H. (Author address not given). **Phosphorus poisoning in children.** *J. Am. Med. Assoc.* 235(13): 1366; 1976. (2 references)

Elemental phosphorus occurs in two forms: red, which is nontoxic; and yellow (white), which is a deadly poison. Legislation has eliminated yellow phosphorus from match tips, fireworks, and quack remedies, but, due to the increasing resistance of rodents to warfarin-containing substances, yellow phosphorus had come back

on the market as a rodenticide paste recommended for use by spreading on crackers or bread. This practice increases the attractiveness of the paste to both rats and small children. Three cases of acute poisoning following rodenticide ingestion by children were recently reported. None of the patients exhibited the classical symptoms of acute yellow phosphorus poisoning, the diagnosis being assisted by a history of ingestion, garlic odor to the breath, stool, or gastric contents, smoking stools, and finding of the poison in excretions. Two children died of acute cardiovascular collapse. Although phosphorus is not among the top ten potentially toxic substances ingested by children, elmination of the phosphorus-containing rodenticides from the market would afford complete prevention of further poisonings.

76-1678. Nagy, G.; Varga, G.; Thurzo, A.; Szilagyi, M. (Dep. Skin Venereal Diseases, Kiskunfelegyhaza Municipal Hospital, Kiskunfelegyhaza, Hungary). **Hydroarsenicismus chronicus regionalis endemicus eseteink. [Endemic chronic arsenic poisoning caused by water.]** *Borgyogy. Venerol. Szemle* 51(1): 19-26; 1975. (21 references) (Hungarian)

Several cases of chronic arsenic poisoning were noted in the children of farming inhabitants of Alsomonostor near Bugac. Chronic arsenic poisoning was diagnosed in 9 persons, 7 of whom showed the characteristic skin symptoms. Well-water containing arsenic was cited as the cause of the problem. In the 21 wells located in this territory, the concentration of arsenic was 0.06-4.0 mg/l. This is higher than the permissible limit. It is suggested that the arsenic originated from pesticides containing arsenic. The pesticides may have contaminated the wells by filtering in together with the subsoil.

76-1679. Cent. Inform. Toxicol. (Univ. Antioquia Sch. Med., Medellin, Colombia). **Tratamiento para intoxicaciones por rodenticidas. [Treatment for poisonings caused by rodenticides.]** *Antioquia Med.* 22(9-10): 699-699-704; 1972. (6 references) (Spanish)

Therapeutic directives are given for rodenticide poisonings caused by thallium sulfate or thallium acetate; warfarin or Racumin; zinc phosphide; barium carbonate, barium chloride, or barium hydroxide; Paris Green (cupric acetoarsenite); arsenic pentoxide; and strychnine sulfate. Gastric lavage is performed in all cases, with albumin water (four whites of egg in 1 liter of water or 1% sodium thiosulfate solution for thallium sulfate poisoning; activated charcoal (25 g in 250 ml water) or 5% sodium bicarbonate solution for warfarin; albumin water + 1.5000 potassium permanganate solution as the last lavage for zinc phosphide; 2-5% magnesium sulfate (epsom salt) or sodium sulfate (Glauber's salt) for barium carbonate; tepid water and milk for arsenic pentoxide; and an unspecified type of lavage or emesis for strychnine sulfate. Magnesium sulfate and castor oil are given for thallium sulfate; and sodium sulfate (30 g in 250 ml water, up to 24 hr after the poisoning) for warfarin, zinc phosphide, barium carbonate, and arsenic pentoxide is used as a cathartic. Specific treatments are: activated charcoal (0.5 g/kg twice a day for five days p.o.) + potassium chloride (3-5 g/d for five days p.o.), sodium penicillin 500 thousand U/kg/day for 10-12 days, probably i.v., and 10% sodium thiosulfate (usually 1 ml every 8 hr, i.v.) for thallium sulfate poisoning; vitamin K (50-100 mg for adults, 10-20 mg for children, i.m. or i.v.) as antidote for warfarin; Dimercaprol-BAL (3-5 mg/kg, i.m., every 4 hr in first day, every 6 hr the 2nd day then decreasing the dosage according to clinical development) as an antidote for zinc phosphide; precipitation of the barium with 10% sodium or magnesium sulfate solution (10 ml slow i.v. injection every 15 min until clinical improvement) + sodium sulfate (30 g in 250 ml water, p.o.), as antidote for barium carbonate, while potassium therapy is essential when hypokalemia is present. A mixture of 30 ml ferric chloride tincture and 30 g sodium carbonate in 120 ml water is given as antidote for recent arsenic pentoxide poisoning and the precipitate formed is removed by gastric lavage, while BAL (3 mg/kg every 3 hr for three days × 3 d., then t.i.d. × 10 d.) is the general antidote; oral treatment with tannic acid solution (1 g/l), potassium permanganate solution (250 mg/l), and activated carbon are given for strychnine sulfate poisoning if convulsions have not started. Convulsions are controlled by barbiturates, and mephenesin i.v. is indicated as a muscle relaxant. Principal symptoms are described and some symptomatic therapy and clinical tests are recommended.

76-1680. Shephard, D. A. E. (Canadian Med. Assoc. J., Ottawa, Ontario, Canada). **Methyl mercury poisoning in Canada.** *Can. Med. Assoc. J.* 114(5): 463,466,467,470,472; 1976. (26 references)

In 1965, an outbreak of methyl mercury poisoning was reported among fishermen and their families in Minamata, Japan. The poisoning appeared to result from the consumption of mercury-contaminated fish from Minamata Bay. Through December 1974, 798 Japanese persons had been verified as having Minamata disease; of these, 107 died. Iraq has had three outbreaks of organic mercury poisoning, all related to the ingestion of grain treated with a methyl mercurial fungicide. A family in New Mexico was crippled by methyl mercury poisoning after eating meat from hogs which had consumed similarly treated seed grain. In contrast, clear-cut evidence of methyl mercury poisoning was not found among Swedes who consumed large amounts of contaminated fish, although nervous system abnormalities were observed. Poisoning may be evident at blood mercury concentrations above 1000 ppb, and concentrations exceeding 3000 ppb are associated with lethal damage; on the other hand, concentrations up to 600 ppb are toxicologically insignificant. Evidence indicates that some Canadians, particularly fish-eating Canadian Indians, have unacceptably high whole-blood concentrations of mercury. Because of the possibility of mercury-induced brain damage in these indi-

viduals the responsibility for controlling mercury poisoning should be handled by a single group, the effects of methyl mercury should be further investigated, and a mature philosophical approach to the management of environmental problems should be adopted.

76-1681. Arena, J. M. (Dep. Pediatrics, Duke Univ. Med. Cent., Durham, NC). **Poisoning.** *Emerg. Med.* 8(4): 171-183; 1976.

The four cardinal principles of good management in cases of acute poisoning are: identification of the drug or chemical as quickly as possible; evacuation of the poison from the stomach, except when contraindicated; administration of an antidote if available; and symptomatic and supportive therapy as indicated. Evacuation of the stomach may be accomplished by emesis or gastric lavage. General measures often required for proper management are the establishment of adequate airway via intubation, elevation of the legs and head, elastic bandaging of the legs, parenteral fluid administration, electrocardiographic examination, recording of vital signs, and i.v. vasopressor administration. Antibiotic administration, hemodialysis, exchange transfusion, forced diuresis, maintenance of respiration and circulation, and fluid therapy may be required. Complications of poisoning may include acidosis, renal failure, shock, coma, cranial hypertension, and/or convulsions. Prevention of poisoning requires education of physicians, manufacturers, nurses, community organizations, and the general public, the use of effective safety containers and closures for household poisons, and the establishment of properly functioning poison control centers.

76-1682. Luzhnikov, E. A.; Savina, A. S.; Shepelev, V. M. (National Poisoning Center, Moscow, USSR). **O patogeneze narusheniya ritma i provodimosti serdsta pri ostrykh otravleniyakh fosfororganicheskimi insektitsidami.** [**Pathogenesis of cardiac rhythm and conductivity disorders in acute organophosphate insecticide poisoning.**] *Kardiologiya* 15(9): 126-129; 1975. (9 references) (Russian)

During the acute period of poisoning with organophosphorus insecticides in 73 patients, a study was made of the ECG and potassium and sodium levels in plasma and erythrocytes. Poisoning in these cases was caused by the insecticides thiophos (parathion), chlorophos (trichlorfon), and carbophos (malathion). Severe rhythm and conductivity disorders were revealed in 18.6% of the cases, and caused cardiac arrest and death in 29 of these patients. A sharp increase in the electric systole on the ECG was also noted in all patients during this acute phase. Electrolyte studies showed hypokalemia, hypernatremia, and increased amounts of potassium and sodium in the erythrocytes. It is suggested that the disturbances in the cardiac activity during acute poisonings with organophosphorus insecticides are caused by excessive acetylcholine effects on ion permeability, tending to increase the intracellular potassium.

76-1683. Van Hees, P. A. M.; Jansen, A. P.; Fennis, J. F. M.; Van 'T Laar, A. (Dep. Internal Med., St. Radboud Hosp., Univ. Nijmegen, Nijmegen, The Netherlands). **Forced diuresis in thallium intoxication.** *Neth. J. Med.* 18(4): 125-128; 1975. (19 references)

A 26-year-old woman was hospitalized 48 hr after ingesting large amounts of liothyronine, diazepam, nitrazepam, a rodenticide containing 2-chloro-4-dimethylamino-6-methylpyrimidine, and 750 mg of thallium sulfate. Symptoms were typical of thallium intoxication: violent pains, paresthesias and hypesthesias ascending from the lower limbs to the trunk, hypertension, and tachycardia. Two weeks later, marked hair loss occurred and transverse white lines (Mees lines) appeared on the nails. Every 4 hr, 30 ml of an aqueous suspension containing 3 g colloidal Prussian blue and 8 g sorbitol was introduced into the duodenum by intubation. On days 1, 2, 3, 17, and 18, this treatment was supplemented with i.v. infusions of 0.9% NaCl and 5% glucose. Five weeks after admission, the patient was discharged in good condition; the only residual symptoms were alopecia and disturbed sensibility in the toes. The total elimination of thallium by the patient was 283 mg (47% of the dose ingested); of this amount, 175 mg was found in the feces and 108 mg was found in the urine. The urinary thallium excretion was substantially increased by the forced diuresis.

76-1684. Taylor, J. R.; Martinez, A. J.; Houff, S. A.; Harbison, J. W.; Selhorst, J. B.; Jackson, R. S. (Richmond, VA). **Neurologic disorder induced by Kepone: preliminary report.** *Neurology* 26(4): 358; 1976.

In July 1975, workers in a Virginia plant were found to be suffering from Kepone (chlordecone) intoxication. Subsequently, 117 of the 149 current and previous employees of the plant were studied. Of 45 cases studied so far, 44 contained measurable levels of Kepone, and 57 of the 117 subjects were symptomatic by history or at the time of examination. The affected subjects presented with a syndrome involving weight loss; tremor, primarily in the upper extremities; unusual ocular motility best described as opsoclonus; pleuritic chest pain; and arthralgia. Routine chemical studies revealed abnormalities of liver function and high residue accumulation in the liver and body fat. Peripheral nerve biopsies showed accumulations of parallel-crystalloid dense bodies which resembled Pi granules of Reich within Schwann and Remak cell cytoplasm. Subsarcolemmal and intermyofibrillar accumulations of lipofuscin and variable amounts of amorphous electron-dense structures were found in the skeletal muscle. The data suggests that Kepone produces a neurologic disorder involving the brain as well as the peripheral nerves and muscle.

76-1685. Nagy, G.; Varga, G.; Thurzo, T. (Municipal Hospital, Kiskunfelegyhaza, Hungary). **Ivoviz okozta, endemias, chronicus arzenmergezesek klinikai es kozegeszsegugyi tanulsagai.** [**Clinical and hygienic aspects**

of chronic endemic poisonings due to contaminated drinking-water.] *Orv. Hetil.* 116(9): 497-500; 1975. (27 references) (Hungarian)

Chronic endemic poisoning due to arsenic-contaminated well water was observed and clinically confirmed in 9 persons, mainly children, at Bugac-Alsomonostor, Hungary, in early 1973. Dermatological symptoms of arsenic poisoning (melanoderma, keratoderma, livedo cutis racemosa, paronychia) were observed in 7 patients. Alopecia, hepatomegaly, and arsenic-induced influenza and pneumonia were also observed. The arsenic levels were between 840 and 5,415 μg% in hairs, and between 0.030 and 0.244 mg/l in urine. Water samples from 20 wells in the endemic area contained 0.06-4 mg/l arsenic, averaging 0.83 mg/l. The contamination of well water was due to arsenic-containing pesticides used in orchards and vineyards. All other sources of arsenic could be ruled out with certainty.

76-1686. Iranyi, J. (National Inst. Rheumatology and Physiotherapy, Budapest, Hungary). **A szerves foszforsaveszter mergezest koveto polyneuropathia esetei.** [**Organophosphate-induced polyneuropathy.**] *Orv. Hetil.* 116(27): 1572-1575; 1975. (29 references) (Hungarian)

Two cases are reported of toxic polyneuropathy following acute oral poisoning with a trichlorfon-containing pesticide (Flibol E) in suicide attempts by two men, aged 50 and 39 yr, under the influence of alcohol. Polyneuropathy appeared about 2 weeks after apparent recovery from the acute poisoning. Hypesthesia, paresthesia, and paresis of the peroneal nerve were observed. Electromyographic examinations revealed serious degeneration of axons and slow reinnervation. The lesions affected primarily the motor neurons. Biopsy revealed demyelination, which was possibly secondary to degeneration. Both patients recovered in about 18 months with residual paroneal paresis. A literature review of 41 cases of toxic polyneuropathy following acute poisoning with organophosphorus pesticides indicates no prevalence of this affection in alcoholics.

76-1687. Kontek, M.; Marcinkowska, B.; Pietraszek, Z. (Author address not given). **Badania elektroencefalograficzne u pracownikow rolnych eksponowanych na pestycydy z grupy zwiazkow fosforoorganicznych i karbaminianow.** [**Electroencephalographic investigations in farm workers exposed to pesticides from the group of organic phosphorus derivatives and carbamates.**] *Pol. Tyg. Lek.* 28(48): 1879-1881; 1973. (6 references) (Polish)

EEG investigations were carried out in 25 farm workers exposed to organophosphorus and carbamate insecticides. In 11 of these workers the studies were conducted both before and after exposure to the chemicals. The remaining 14 workers were tested only after exposure. A rise in the proportion of abnormal tracings and intensification of previously existing changes were noted after exposure. These changes included periodic increases in the frequency of background activity, low-voltage beta activity, periodic appearance of significant diffuse theta activity, and bursts of sharp waves. After exposure the activity of plasma cholinesterase rose from 0.10 delta pH-hour to 0.83 delta pH-hour. That of erythrocyte cholinesterase was from 0.32 to 0.70 delta pH-hour. There was no correlation observed between the degree of reduction of cholinesterase activity and the intensity of changes in EEG tracings.

76-1688. Eljasz, L.; Krzyszton-Przekop, T. (Neurol. Clin., Inst. Dis. Nervous System and Sensory Organs, Bialystok, Poland). **Przypadek polineuropatii po zatruciu foschlorem.** [**Polyneuropathy as the result of foschlor poisoning.**] *Pol. Tyg. Lek.* 30(44): 1841-1842; 1975. (3 references) (Polish)

A rare case was reported of foschlor (trichlorfon) intoxication with resulting neuropathy. It concerned a 27-yr-old railroad worker who accidentally swallowed half a glass of phoschlor in 1971. Two weeks after the poisonings the patient experienced increasing pains in calves and feet and simultaneous walking difficulties. Although he returned to work after 4 weeks, walking was impaired due to muscle weakness in shanks and feet. Five months after onset of the symptoms, his condition deteriorated. The clinical picture showed neuropathological changes involving sensory impairment in both feet up to the ankles. Patellar reflexes were normal. Positioning of feet was abnormal (clubfooted). EMG (electromyogram) showed neurogenic deviations in the distal parts of the muscles of the lower extremities. All other examinations showed normal results, and other pathogenic factors were eliminated. Therapy consisted of vitamin B group medication, myotriphose and strengthening exercises of the affected muscles. Improvements achieved included disappearance of sensory symptoms and strengthened shank and foot muscles, but a slight weakness in the distal portion of the lower extremities remained and did not subside after six months. Remission of the clinical symptoms was seen as possible even after several months.

76-1689. Kozler, M. (Spolana Factory Polyclinic, Neratovice, Czechoslovakia). **Lokalni ucinek dioxacarb na oku.** [**The local effect of dioxacarb on the eye.**] *Prac. Lek.* 27(6): 209-210; 1975. (1 reference) (Czech)

A female factory worker was treated for injuries to her eye sustained from penetration of a 3% spray of Dioxacarb. A unilateral narrowing of the pupil of the eye was observed before treatment. In addition, the woman was reported to have blurred vision. Vital signs were blood pressure 120/75, pulse 80, and body temperature 36.6°C. One mg of atropine was given therapeutically. After three hours, a recession of the miosis was observed; the patient reported relief of symptoms; and laboratory findings of FW, SGOT, SGPT, and cholinesterase readings registered normal.

76-1690. Plimmer, J. R. (Plant Sci. Res. Div., Agric. Res. Serv., U.S. Dep. Agric., Beltsville, MD 20705). **The significance of pesticide contaminants.** *Progr. Anal. Chem.* 5: 153-174; 1973. (37 references)

The chlorinated dibenzo-*p*-dioxins and some related neutral compounds are contaminant by products which may arise during the manufacture of chlorinated phenols. These compounds are extremely toxic and their presence in chlorophenols or pesticides synthesized from chlorophenols has presented serious problems. These problems have occurred during the manufacture of the herbicide 2,4,5-T and in the preparation of commercial fatty acids for chicken feeds. On several occasions outbreaks of chick edema disease have been ascribed to the presence of dioxin contaminants in the feed fats. 2,3,7,8-Tetrachlorodibenzo-*p*-dioxin (TCDD), the most toxic impurity in 2,4,5-T, has resulted in the appearance of a severe skin disease, chloracne, in workers involved in the manufacture of the herbicide. TCDD is formed from an intermediate (presumably 2,4,5-trichloroanisole) during the manufacture of 2,4,5-T. In addition to TCDD, there are over 70 chlorinated dibenzo-*p*-dioxins, and many possess toxicity approaching that of TCDD. Analysis of the dioxins may be accomplished by single or multiple-column gas chromatography, sometimes in conjunction with liquid chromatography. Mass spectrometry combined with gas chromatography is also a powerful analytical technique.

76-1691. Lorgue, G.; Delatour, P. (Author address not given). **Le Thallium.** [**Thallium.**] *Rev. Med. Vet. (Toulouse)* 125(8-9): 1204-1205; 1974. (French)

The toxic dose of thallium is approximately 10 mg/kg for most animal species. Intoxication is accidential: oral ingestion of rat poisons or industrial pollution of waters. Subacute intoxication symptoms are digestive (abdominal pains, frequently hemorrhagic gastroenteritis) and neuromuscular (trembling, paralysis of the limbs); death comes within hours. Acute intoxication is characterized by salivation, bronchopneumonia, subcutaneous hemorrhage, and death within a few days. Chronic intoxication is characterized by ulceration of the tongue and of the buccal mucosa, thickening and wrinkling of the skin, and hair loss. There are no specific lesions. Treatment is symptomatic but usually ineffective. Sulfur-containing amino acids, methionine and cysteine seem to have a certain protective effect. Thallium is determined by polarography in stomach, liver, and kidney tissue samples.

76-1692. Alvarez, L. E. (Author address not given). **Reglamento para el control y uso de herbicidas.** [**Directive for the control and use of herbicides.**] *Salud Pub. Mex.* 15(2): 271-281; 1974. (Spanish)

The text is presented of a decree issued by President Alvarez of Mexico on December 13, 1973 relating to the control and use of herbicides. Official definitions are given of the following: herbicide, weeds and invasive plants, formulator, susceptible crop, residue, application system, and others. The decree prohibits the use and sale of unauthorized herbicides, the operation of aerial application equipment without licensing, engagement of aerial equipment without permission, application in areas where susceptible neighboring crops will be affected, the use of unauthorized herbicides in authorized equipment, and aerial application during unfavorable weather conditions. Instructions are also given for registration and licensing, containers, handling, application, importation, inspection, and penalties for violation.

76-1693. Reyes Najera, R.; Sanchez de la Fuente, E. (Dep. Preventive Med., Sanitary Jurisdiction of Torreon Prov., Coahuila, Mexico). **Intoxicacion por plaguicidas en la comarca lagunera durant el ciclo agricola de 1974.** [**Poisonings caused by pesticides in the marshy regions during the agricultural season of 1974.**] *Salud Pub. Mex.* 17(5): 687-698; 1975. (Spanish)

A statistical survey is presented on 847 cases of poisoning (97.8% men and 2.2% women; 4.4% were less than 14 yr of age, 42.8% were 15-24 yr old, 18.4% were 25-34 yr old, 10.9% more than 35 yr old, and 23.5% were of unknown age) caused by pesticides in the marshy region of the states of Coahuila (90.1% of the cases) and Durango (9.9% of the cases) in Mexico, representing a general morbidity of 121.1/100 thousand inhabitants. The causal agents were: mebidrin in 37.8% of the cases; parathion in 16.5%, Arylam (carbaryl) in 11.0%; azodrin (monocrotophos) in 8.9%; lannate (methomyl) in 6.9%; gusathion (azinphosmethyl) in 2.3%; and other organophosphorus compounds in 14.8%. In 1.6% of the cases attributed to chlorinated hydrocarbons, it was found that the victims were poisoned by organophosphorus compounds from the neighboring parcels of land. The route of contamination was by inhalation in 92.5% of the cases, ingestion in 5%, and contact in 2.5%. By occupation, 91.4% were fumigators and/or laborers, 6.1% supervisors or transportation workers, and 2.5% were students, housewives, and others. The poisonings were very severe in 1.3% of the cases, severe in 4.8%, and slight in 93.9%. All presented muscarinic-type and nicotinic-type symptoms. All subjects appear to have been exposed to the pesticides for at least 3 days before the manifestation of symptoms. The slight cases did not require hospitalization; the severe cases were hospitalized for 24 but less than 72 hr, and the very severe for more than 72 hr. All patients were treated with atropine (6-14 mg in the slight cases; 14-50 mg in the severe and very severe cases, but mostly 16-32 mg). There were four deaths, representing a mortality of 0.56/100 thousand inhabitants. Since most of the pesticides had a dangerously low LD50, the author advises that a minimal educational level be required for the population that uses such substances. The establishment of a permanent system of hygienic education, a legislation system, and a commission for protection against careless use of pesticides is also recommended.

76-1694. Anonymous. [**Standards for food additives and pesticide residues supplemented with standards for dairy**

products.] *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Jpn.)* 17(1): 105-132; 1976. (Japanese)

Standards are listed for pesticide residues in agricultural foods (value limits less than those allowed by the Food Safety Law). These foods include cereals (4), legumes (4), fruits (15), tea (nonfermented), cow's milk, and vegetables (31). The pesticides are bromine, arsenic and its compounds, lead and its compounds, total BHC, captafol, captan, chlorobenzilate, chlorfenvinphos, dicofol, total DDT, dieldrin (including aldrin), endrin, nine organophosphorus pesticides (including diazinon, EPN, malathion, parathion), carbaryl, and tricyclohexyltin hydroxide. It should be noted that all standards have not been established for all listed agricultural products.

76-1695. Hoskam, E. G.; Smit, T. (Centraal Diergeneeskundig Instituut, Rotterdam, The Netherlands). **Crimidinevergiftiging door "Castrix"-korrels.** [**Crimidine poisoning due to ingestion of "Castrix" grains.**] *Tijdschr. Diergeneesk.* 99(18): 942-947; 1974. (4 references) (Dutch)

Unrelated cases are reported of lethal poisoning of several cats, two pheasants, and one dog with Castrix grains, containing 0.15% crimidine as active ingredient. Castrix grains were found in the gastric contents in all cases. Lung edema with focal hemorrhages was found in certain cases. Poisoning tests on quails revealed an oral LD50 of about 20 mg/kg of crimidine, corresponding to about 30 grains. The intraperitoneal LD50 in dogs is 0.5 mg/kg.

76-1696. Van Ulsen, F. W. (Gezondheidsdienst voor Dieren in Overijsel, Zwolle, The Netherlands). **Honderd vergiftigde honden.** [**One hundred poisoned dogs.**] *Tijdschr. Diergeneesk.* 99(18): 947-948; 1974. (2 references) (Dutch)

The causes of death are analyzed of 100 poisoned dogs, reported in the province of Overijsel, The Netherlands, during the last three years. The lethal poisoning was due to strychnine in 72 cases, to lead in 7 cases, to parathion in 6 cases, to metaldehyde in 5 cases, to brucine in 4 cases, to thallium in 3 cases, to nicotine-like substances in 2 cases, and to arsenic in 1 case.

76-1697. Tauris, P. (Silkeborg Centralsygehus, Med. Afd., DK-8600 Silkeborg, Denmark). **Akut thalliumforgiftning.** [**Acute thallium poisoning.**] *Ugeskr. Laeger* 137(26): 473-474; 1975. (12 references) (Danish)

Acute thallium poisoning is reported in a 35-yr-old woman due to suicidal ingestion of 7.4 g of thallium sulfate in a mole control agent. Hallucinations, motor coordination disturbances, distal polyneuropathy, peripheral dysesthesia, loss of consciousness, intermittent choreiform hyperkinesis, pulmonary stasis, hypotension, anuria, subileus, and death due to pulmonary edema 51 hr after thallium ingestion were observed. Treatment with Berlin blue and mannitol was difficult due to gastrointestinal symptoms.

76-1698. Pol'chenko, V. I.; Tkach, L. I.; Gumennyy, V. S. (All-Union Sci. Res. Inst. Toxicol. Pestic., Polymers, and Plastics, Kiev, USSR). **Sravnitel'naya rasprostranennost' zabolevaniy v dvukh sel'skikh zonakh s razlichnoy intensivnost'yu primeneniya pestitsidov.** [**Comparative incidence of diseases in two rural zones with various intensities of pesticide use.**] *Vrach. Delo* 12: 106-108; 1975. (Russian)

Incidences of different diseases were studied and compared in an area with limited use of pesticides and in another area in which the intensity of pesticide use was 4 times higher. The climatic, social, and hygienic features were similar in both areas, and the age and sex differences were eliminated. Statistically significant differences were established in morbidity. Compared with the control area, the incidence of circulatory diseases was higher by 36.4%, and that of the nervous system and of the sensory organs by 8.7% in the area with intense use of pesticides. The overall morbidity rate was 5.6% lower in the control area. Chronic coronary insufficiency, myocarditis, myocardiodystrophy, polyneuritis, polyradiculitis, chronic gastritis and colitis, lung tuberculosis, residual pneumonia, chronic nephritis and cystitis, urticaria, eczema, and dermatitis were more frequent, especially among women, in the area with intense use of pesticides. The findings indicate that the intense use of pesticides can influence the incidence of certain diseases.

76-1699. Wolff, F. (Bezirksinspektion Gesundheitsschutz in den Betrieben Neubrandenburg, 20 Neubrandenburg, DDR). **Noxen fuer den Atemtrakt in der Landwirtschaft.** [**Respiratory diseases due to noxious agents in agriculture workers.**] *Z. Erkr. Atmungsorg.* 143(1): 4-15; 1975. (39 references) (German)

Allergens, pathogens, dust, and chemical substances capable of affecting the respiratory tract of agricultural workers are reviewed. Plant protecting agents, of which about 90 are commercially available in East Germany in over 200 different formulations, may be responsible for occupational poisoning due to inhalation, while skin resorption is usually just as hazardous as inhalation. Organophosphorus preparations, organomercurials, DNOC, DDT, BHC, organotin compounds, and antibiotics are most toxic and problematic during their application. Exposure to plant protecting agents is intermittent, and their application will be increasingly limited to critical periods of pest overpopulation.

76-1700. Burkatskaya, E. N. (Author address not given). **Pervaya pomoshch' pri otravlenii yadami.** [**First aid during poisoning by toxic chemicals.**] *Zashch. Rast.* (Moscow) 8: 40-41; 1974. (Russian)

General recommendations are given concerning first aid during poisoning with toxic chemicals. The continued skin resorption of organophosphorus compounds should be prevented by washing off with 5-10% ammonium hydroxide solution. A 2 solution of sodium bicarbonate should be used to remove pesticides from the eyes. Organophosphorus pesticides, degrading in alkaline medium,

should be neutralized with sodium bicarbonate in the stomach. Activated charcoal is then given in 2-3% baking soda solution for adsorption. Persons poisoned with DNOC, nitrofen, pentachlorophenol, and sodium pentachlorophenate should be kept under hypothermic conditions. Persons poisoned with organophosphorus pesticides should be given atropine.

76-1701. Sugaya, H.; Hayashi, S.; Suzuki, T.; Hayashi, M.; Ito, S.; Kimura, M.; Kurokawa, S. (Inst. Rural Med., Hiraga Gen. Hosp., Akita, Japan). [**Results of a health survey on persons engaged in pesticide application.**] *Report on Studies Commissioned by the Ministry of Health and Welfare 1974*, Jpn. Soc. Rural Med., Part 1-2, 1976, pp. 1-4. (Japanese)

Medical examinations were carried out on 23 members of a cooperative plant protection group in a fruit and rice growing area in the town of Hiraga. Similar examinations have been performed here for the last 5-7 years. Only one person examined showed a high urinary *p*-nitrophenol value. Marginal RBC counts were found in 3 men. Marginal hematocrits were found in 5 persons. Borderline serum protein levels were found in 4 persons. Borderline serum alkaline phosphatase was found in only one person. The average serum cholinesterase activity was a little lower than normal at 0.67. Abnormal values of GOT and GPT were found in one person, and two persons showed marginal or abnormal values for one of these. Chemical dermatitis was found in 4 persons, pompholyx in 2, dermatotrophic symptoms in 2, and deformed nails in 7. Hypertension was found in 3 persons and hepatic disturbances also in 3 although 2 cases were merely suspected. Allergic rhinitis was found in one person, chronic tympanitis in 2, paranasal sinusitis in one, and tinnitis in 2. In 42.3% of the cases the subjective symptoms lasted for 4 months; the morbidity rate was 27.1%.

76-1702. Matsushima, F.; Horiguchi, Y.; Yanagisawa, T.; Ueki, S.; Ide, H.; Yokoyama, Z. (Saku Gen. Hosp., Usuda, Nagano, Japan). [**Studies on methods of health supervision of persons engaged in pesticide application, Part 2. Results of examinations of flower growing workers.**] *Report on Studies Commissioned by the Ministry of Health and Welfare 1974*, Jpn. Soc. Rural Med., Part 1-2, 1976, pp. 5-11. (Japanese)

Because of the frequent pesticide intoxication of flower growing workers in Nagano Prefecture, health examinations were carried out on 56 workers who had been thus employed for 5-10 years in Koshoku City, in this prefecture, where vinyl greenhouse culture of carnations and Turkish campanula prevails. The principal pesticides applied were dichlorvos, vamidothion, estox (metasystox-S), fenthion, fenitrothion, maneb, Monox, chlorobenzilate, and Bordeaux mixture. Anemia was found in 28.6% of the workers in April and 25% in July; these values were higher than those in other areas. Greatly reduced serum ChE levels were found in 14.8% of the men and 17.3% of the women. Abnormal values of LDH and alkaline phosphatase were found in many persons; however, this percentage did not differ greatly from that of other inhabitants of the Prefecture. Although there were no gross abnormalities, there were many persons with some irregularities in their electroencephalogram; however, according to neurological examinations there was little abnormality. It was felt that the establishment of examinations of the nervous function of persons engaged in pesticide application was necessary.

76-1703. Nagata, H.; Izumiyama, T.; Kamata, K.; Takano, S.; Saito, M.; Suzuki, K.; Kobayashi, S.; Uamagishi, M.; Kurotani, S.; Takahashi, K. (Kokushin Gen. Hosp., Nakano, Nagano, Japan). [**Studies on health supervision methods for pesticide applicators. Long-term tracing survey on operators of speed sprayers in crop protection cooperatives.**] *Reports on Studies Commissioned by the Ministry of Health and Welfare 1974*, Jpn. Soc. Rural Med., Part 1-2, 1976, pp. 12-17. (2 references) (Japanese)

Health examinations were carried out on 57 operators of speed sprayers in 1973 and 41 in 1974 in apple orchards in Nakano City, Nagano Prefecture. The frequency of anemia was notably higher in summer, the pesticide application season, than in winter, when no pesticides were applied. The results of liver function examinations in 1974 showed no improvement compared to those in 1973 with reference to bilirubin, LAP, and LDH. Two of the workers were placed on disability due to stomach cancer and chronic liver damage. Abnormal electroencephalogram findings were more frequent than in normal persons according to the literature, before and after the pesticide application season, with slightly lower values before application.

76-1704. Uchida, A.; Takamiya, T.; Ishige, T. (Inst. Environ. Epidemiol., Fac. Med., Chiba Univ., Chiba, Japan). [**Studies on methods of health management of persons engaged in pesticide application. Application of pesticides in Chiba Prefecture and health survey therein.**] *Report on Studies Commissioned by the Ministry of Health and Welfare 1974*, Jpn. Soc. Rural Med., Part 1-2, 1976, pp. 18-24. (Japanese)

A health survey was carried out on pesticide applicators from June 1974 to January 1975 in a village agricultural cooperative association outside of Chiba City, in a pear growing area and 3 areas of greenhouse culture. The major pesticides were dithane (maneb), fenitrothion, and gramoxone (paraquat). The health impairments due to pesticide application consisted of acute poisoning, dermatitis, and eye irritation and conjunctivitis. It was found that the applicators rarely used protective garments. Results of examinations of multiple crop growers revealed higher morbidity rates of abnormal liver function and anemia than other groups. Pear growing farmers showed higher morbidity rates for myocardial damage, proteinuria, and positive glycosuria.

76-1705. Kato, T.; Nishikawa, T.; Yamamoto, S.; Noda, H.; Wada, K.; Kato, H.; Ogura, K.; Morishita, M.; Suzuki, H.; Tsutsui, J. (Chusei General Hospital, Mie, Japan). [**Effects of pesticides on the health of pear growers in Hane area, Ueno City, Mie Prefecture.**] *Report on Studies Commissioned by the Ministry of Health and Welfare 1974*, Jpn. Soc. Rural Med., Part 1-2, 1976, pp. 27-30. (Japanese)

Results were reported of medical examinations carried out on pear growers in the Hane area in October 1974 (the working season) and February 1975 (the leisure season), on 54 and 46 persons, respectively. The major repeatedly applied pesticides were EPN, Kitazin-P(IBP), Dithane (maneb), fenitrothion, malathion, and Kitathion. The major subjective symptoms in pesticide applicators included dermatitis. The percentages of examined persons with anemia, reduced hematocrit, reduced total protein in blood, increased GOT and GPT, reduced cholinesterase, and hypertension during the busy farming season were 14.8, 5.6, 9.3, 11.1, 3.7, 1.9, and 13.0, respectively. Those in leisure season were 8.7, 0, 2.2, 2.2, 2.2, 0, and 17.4, respectively. Some abnormal findings appeared on the ECG, consisting mainly of enlarged left cardiac ventricle, abnormal ST-T, and extrasystole. Generally the findings on the farmers' health state were the same as those in 1973, except for a greater number of persons with increased total cholesterol in the leisure season.

76-1706. Takamatsu, M.; Esaki, H.; Rikimaru, T.; Goto, T.; Inoue, Y.; Sakurai, T.; Hirayama, H.; Nakakoshi, R.; Hara, K.; Takeuchi, T.; Teruya, H.; Abe, J.; Shirosaki, E. (Sch. Environ. Hyg., Fac. Med., Kurume Univ., Kurume, Fukuoka, Japan). [**Studies on the method of health management of persons engaged in pesticide application. Status of pesticide application in vinyl greenhouses and results of health examinations.**] *Reports on Studies Commissioned by Ministry of Health and Welfare 1974*, Jpn. Soc. Rural Med., Vol. 1-2, 1976, pp. 31-35. (3 references) (Japanese)

Tomatoes, cucumbers, eggplants, strawberries, and chrysanthemums are grown in large vinyl greenhouses in the Chikugo area of Fukuoka Prefecture. The present report concerned the status of pesticide application and health of farmers cultivating tomatoes, eggplants, and strawberries. The major pesticides for tomato are Daconil (chlorthalonil), Dithane (maneb), thiophanate, benlate (benomyl), Sanipar (milneb), and estox (metasystox-S); those for eggplants are estox, Pic, Daconil, thiophanate, and dichlorvos; those for strawberry are polyoxin, thiophanate, Sanyol, methomyl, benlate, kelthane (dicofol), and Dithane. Contact dermatitis during application was found in 23.3% of the men and 7.1% of the women; a 53% reduction was achieved by the use of protective clothing. The numbers of applicators complaining of headache, dizziness, nausea, ocular congestion, and contact dermatitis after application were 33.3 and 28.2% respectively for men and women, but no serious cases of intoxication were seen. Of the hematologic findings, anemia was noticed in strawberry growers, especially in women, and some men showed elevated GOT and GPT. In the case of urinalysis results, proteinuria and positive sugar were found in some men. Pesticide applicators generally made 20-29 applications/year but some made as many as 100.

76-1707. Nomura, S.; Matsushita, T.; Arimatsu, T.; Tomio, T. (Sch. Pub. Health, Fac. Med., Kumamoto Univ., Kumamoto, Japan). [**Results of health examination on persons applying organosulfur fungicides.**] *Report of Studies Commissioned by the Ministry of Health and Welfare*, Jpn. Soc. Rural Med., 1974, Vol. 1-2: 1976, pp. 36-42. (Japanese)

Many cases of contact dermatitis occurred during the last three years among applicators of thiophanate-methyl for preventing putrefaction of stored citrus fruits in citrus orchard areas in Kumamoto Prefecture. Medical examinations were carried out on those who used thiophanate-methyl and on those who used benlate (benomyl). The morbidity rates for dermatitis in men who applied thiophanate-methyl were 30.3, 48.2, and 52.8% in 1972, 1973, and 1974, respectively, and the rates in women were 32.3, 56.3, and 64.8% in the corresponding years. The rate of dermatitis development in men who applied benlate was only 0.6-2.3%, and in women 1.0-5.4%. Specifically the pesticides that caused dermatitis were emulsified sulfur and calcium polysulfide as well as thiophanate-methyl. The symptoms are itching, redness, swelling, dry skin, and sometimes sensitized dermatitis, as well as congestion of the ocular mucosa. Results of medical examination revealed some abnormalities of hemoglobin. In patch tests, the percentage of positive reactions was about 5 for both maneb and thiophanate methyl.

See also **76-1598 76-1633 76-1809**

76-1708. Strzelec, A. (Dep. Agric. Microbiol., Inst. Soil Sci. Plant Cultivation, Pulawy, Poland). **The influence of glucose on simazine decomposition.** *Acta Microbiol. Pol. Ser. B* 7(24): 91-9..; 1975. (8 references)

Noncultivated, air-dried, sieved sandy soil (100 g) was mixed with 2 mg of simazine containing 50% active ingredient. Varying amounts of glucose in water solution were added to the soil samples and the soil moisture was maintained at 50% of the total water capacity. The soil samples were incubated in plastic pots at 28°C. Herbicide residues in the soil were assessed by thin-layer chromatography. Simazine reduced the numbers of bacteria and actinomycetes in the soil; the addition of glucose diminished this effect. Both simazine and glucose increased fungal development, and glucose enhanced the decomposition of simazine in the soil in a dose-dependent manner. In a second experiment, 0.5 mg of pure simazine dissolved in ether was added to sterile Czapek medium supplemented with 0-20 g glucose; the media were then inoculated with homogenized cultures of *Penicillium citrinum*. In the presence and absence of simazine, glucose enhanced the dry mass increase of *P. citrinum*. Simazine had no marked effect on fungal growth, and the rate of its disappearance from the medium was directly proportional to the glucose content and rate of mycelium growth. The results indicate that *P. citrinum* is able to decompose simazine and to absorb a small amount of the herbicide.

76-1709. Faff, J.; Borkowska, G.; Bak, W.; Raszewski, W. (Dep. Toxicol., Milit. Hyg. Epidemiol. Inst., Warsaw, Poland). **Acetylcholinesterase activity in the rat tissues during chronic phospholine poisoning.** *Acta Physiol. Pol.* 26(5): 517-522; 1975. (18 references)

Phospholine (0.04 mg/kg) was given s.c. once daily for 1-28 days to male Wistar rats. The compound caused only slight and transient symptoms of poisoning, including increased excitability, muscle twitching, and weakness of the extremities. Acetylcholinesterase inactivation in the erythrocytes, diaphragm, and tibialis muscle, and cholinesterase inactivation in the plasma was evident after the first dose of phospholine. After the first few days, the enzyme activity stabilized, and during the second week of treatment, the plasma was probably involved with intensive regeneration of the plasma cholinesterase during chronic poisoning. Phospholine administration had no effect on the process of acetylcholinesterase regeneration in the erythrocytes, diaphragm, and tibialis muscle. The activity of the brain acetylcholinesterase decreased slightly, but only after 21 days of treatment.

76-1710. Ramasso, J.; Ghilino, S. (Dep. Pharmacol., Natl. Inst. Pharmacol. Dietetics, Buenos Aires, Argentina). **Malathion, glucemia, lactacidemia, fragilidad osmotica y metabolismo eritrocitario. [Malathion, glycemia, lacticacidemia, osmotic fragility, and red cell metabolism.]** *Jornadas Argent. Toxicol. Anal. Actas* 1: 7-11; 1971. (5 references) (Spanish)

Rats injected with malathion were studied in terms of their metabolism and osmotic fragility, to establish the toxicity and/or metabolic alterations caused by the pesticide. Fasting blood levels of glucose and lactic acid were measured as indicators of carbohydrate metabolism. Blood from 30 fasting Wistar rats was used for determinations. Fifteen animals were injected i.v. with two administrations of 150 mg/kg malathion; the other 15 were used as controls. Blood sugar and lactic acid levels and glucose-6-phoshate dehydrogenase activity were determined after two hours of incubation. Glucose consumption was determined by the Somogyi-Nelson method, lactic acid by the Baker-Summerson method, dehydrogenase activity by a modified Brewer method, and osmotic fragility by the Parpart method. The lactic acid level was lower and lactic acid production higher. No differences were noted in blood sugar or glucose consumption or in dehydrogenase activity and osmotic fragility. The lower blood level of lactic acid correlated with symptoms in the rats: bradypnea, dyspnea, general vasodilation, and death due to respiratory failure.

76-1711. Lemberg, A.; Gimenez, E. R.; Izurieta, E. M.; Fernandez, N. R.; Tassara, R. L. (Toxicol. Cent., Children's Hosp., Clin. Anal. Dep., Sch. Pharm. Biochem., Buenos Aires, Argentina). **Modificaciones del magnesio, calcio, potasio y sodio en la intoxicacion experimental por paration. [Modifications of magnesium, calcium, potassium, and sodium in toxicology experiments with parathion.]** *Jornadas Argent. Toxicol. Anal. Actas* 1: 51-57; 1971. (6 references) (Spanish)

An experiment was conducted with 21 female rats, 16 of which received 0.5 mg i.p. parathion per 200 grams body weight. Another twelve rats received 1 mg/kg atropine sulfate 45 minutes prior to injection of the same dosage of parathion. Blood samples were taken from the aorta of the rat when the induced muscarinic syndrome had reached its maximum (on the average of 15 minutes). The rats receiving atropine did not develop the muscarinic symptoms while anesthetized but suffered more serious damage when the anesthetic wore off. The calcium and magnesium contents of the blood samples were determined by atomic absorption; sodium and potassium by flame photometry. The parathion injections caused the calcium level to increase from 7.84 to 9.43 mg %, representing a significant difference from the untreated control animals; the two groups receiving parathion did not differ significantly. Both of the parathion test groups also had significantly higher magnesium levels in comparison with controls. The potassium level in rats treated only with parathion was much higher than that of the controls or of the atropinized rats. Sodium levels were the same for controls and for the parathion group but were lower for the atropine-parathion group.

76-1712. Reddy, K.; Omaye, S.; Chiu, M.; Litov, R.; Hasegawa, G.; Cross, C. (Primate Res. Cent., Univ.

California, Davis, CA 95616). **Effect of aspirin (ASA), indomethacin (IND) and hydrocortisone (HYC) pretreatments on selected aspects of rat lung metabolism before and after paraquat administration.** *Am. Rev. Resp. Dis.* 113(4): 102; 1976.

Healthy 60-day-old Sprague-Dawley rats were treated p.o. daily for 5 days with aspirin (ASA, 50 or 100 mg/kg), indomethacin (IND, 0.2 or 1.8 mg/kg), hydrocortisone (HYC, 2.5 or 7.5 mg/kg), or 0.25% agar (control). Half of the rats were injected i.p. with 29 mg/kg paraquat (PQ). Drug pretreatment alone elevated lung cytosolic superoxide dismutase (SOD) 30-70%, glutathione (GSH) peroxidase 5-25%, GSH reductase 8-25%, and total nonprotein sulfhydryls 5-30%. Paraquat-treated control rats, which died within 48 hr, showed elevations of 82% (SOD), 32% (GSH peroxidase), and 36% (GSH reductase). Forty-eight hr after paraquat administration, 13-18% of the SAS-treated rats were alive, 31-80% of the IND-treated rats were alive, and 47-63% of the HYC-treated rats were alive. Elevations of SOD, GSH peroxidase, and GSH reductase in the drug-pretreated rats were significantly lower than in the controls. PQ-treated controls also expired more ethane than the drug-pretreated PQ-injected rats. The data suggests that O_2 and lipid peroxidation may have roles in PQ-induced lung damage. The biochemical changes produced by the anti-inflammatory agents cause a significant augmentation of lung defense capabilities against superoxide anion-induced and hydroperoxide-induced lung damage, which may explain the increased 48-hr survival rates in the pretreated rats.

76-1713. Schwartz, L. W.; Silverman, S. (California Primate Res. Cent., Univ. California, Davis, CA 95616). **Paraquat induced pulmonary damage in nonhuman primates. A morphological study.** *Am. Rev. Respir. Dis.* 113(4): 108; 1976.

Adult stumptail macaques (*Macaca speciosa*) were gavaged with paraquat chloride (100 mg/kg, 75 mg/kg, or multiple doses of 35-75) and were killed 9-31 days later. Paraquat produced radiographic changes in the lungs characterized by an increase in coarse patchy pulmonary densities and reduced lung volume. Microscopic pulmonary damage consisted of intra-alveolar edema, fibrin deposition, massive destruction of Type I and II alveolar epithelium, and infiltration of intra-alveolar and interstitial areas with small hyperchromatic mononuclear cells and spindle-shaped cells. The endothelial cells and bronchial epithelium generally remained intact. Damage involved all lobes equally, although within each lobe, the damage was most severe in the subpleural, perivascular, and peribronchiolar areas. Both intra-alveolar and interstitial fibroplasia were present. Polymorphonuclear inflammatory cells were minimal in number and hyaline membrane formation was not observed. The results indicate that paraquat damage in the monkey is focused in the alveolar epithelium, infiltrating cell types being predominantly mononuclear and fibroplasia occurring both intra-alveolarly and interstitially.

76-1714. Guardigli, A.; Lefar, M. S.; Gallo, M. A.; Laurent, M.; Buys, M. (Rhodia Inc., New Brunswick, NJ 08903). **Residue uptake and depletion measurements of dietary oxadiazon in mammalian and avian species.** *Arch. Environ. Contam. Toxicol.* 4(2): 145-154; 1976. (4 references)

The herbicide oxadiazon, 2-(*tert*-butyl)- 4-(2,4-dichloro-5- isopropyloxy-phenyl)Δ^2- 1,3,4-oxadiazoline 5-one, was fed in a total diet at three dosage levels to groups of dairy cows (0.5, 2.5, and 25 ppm) and to groups of male and laying female quail (20, 80, and 160 ppm) for 28 days. Control animals received basal diet rations. No residue (< 5 ppb) was detected in milk or cream after three days withdrawal from fortified feed. The maximum plateau reached in milk was 83.8 ppb at the highest dosage fed. Tissues of cows sacrificed on the 12th day of withdrawal showed no residues (< 20 ppm). Birds were sacrificed at weekly intervals during acclimation, intake, and withdrawal periods. Eggs were collected at the same intervals. Tissues were free of oxadiazon residues (< 40 ppb) within two to seven days of returning the quail to the basal ration, and the eggs were residue-free within seven to fourteen days. The maximum residues found in adipose tissue of quail and their fresh eggs were 3100 ppb and 5400 ppb, respectively, at the greatly exaggerated dosage of 160 ppm in the diet. A comprehensive analytical methodology, including liquid-liquid partition, absorption chromatography, and electron-capture gas chromatography, is discussed. (Author abstract by permission)

76-1715. Lee, I. N.; Ishizuka, K. (Inst. Phys. Chem. Res., Wako-Shi, Saitama, Japan). **A mode of selective action of thiadiazolyl urea herbicides.** *Arch. Environ. Contam. Toxicol.* 4(2): 155-165; 1976. (6 references)

1,1-Dimethyl-3-(5-*tert*-butyl- 1,3,4-thiadiazol-2-yl)urea (I) was newly synthesized. (I) was found to have the strongest herbicidal activities among the thiadiazolylurea derivatives and selectivity of (I) was found between barley (tolerant) and wheat (susceptible) plants. Neither absorption by roots nor translocation from roots to shoots of ^{35}S-labeled (I) in barley and wheat correlated with selectiv ity between these species of plants. (I) was metabolized in both species of plants by *N*-demethylation to 1-methyl-3- (5-*tert*-butyl- 1,3,4-thiadiazole- 2-yl)urea (II), and further to non-phytotoxic 3-(5-*tert*- butyl-1,3,4- thiadiazol- 2-yl)urea (III). The rates of the *N*-demethylation reactions from (I) to (II) and from (II) to (III) were much greater in barley shoots than in wheat shoots, esepcially in the second demethylation. It was concluded that the selective activity of (I) between barley and wheat plants was mainly due to the difference in rates of *N*-demethylation of (I). In addition, it was found that cotton plants, well known as tolerant to phenylurea herbicides, were remarkably susceptible to (I). It was indicated that different rates of the *N*-demethylating reaction between the phenyl and thiadiazolyl herbicides correlated with susceptibility to them. (Author abstract by permission)

76-1716. Budimir, M.; Plesnicar, M.; Kljajic, R. (Dep. Pesticides, INEP, Zemun, Yugoslavia). **Effects of the herbicide 2,4-DB and fungicide captan on reactions of mitochondria and chloroplasts.** *Arch. Environ. Contam. Toxicol.* 4(2): 166-174; 1976. (15 references)

The effects of the herbicide 4(2,4-dichlorophenoxy) butyric acid (2,4-DB) and the fungicide *N*-(trichloromethylthio)- 4-cyclohexene- 1,2-dicarboximide (captan) on electron transport processes of mitochondria and chloroplasts have been investigated. Chloroplasts, isolated from spinach leaves (*Spinacia oleracea* L.), were treated with pesticide prior to the addition of electron acceptor and ADP. White potato (*Solanum tuberosum* L.) mitochondria were either incubated with pesticide before the addition of substrate, or they were treated with pesticide after the addition of substrate and ADP. Captan inhibited oxidation of malate by mitochondria and acted as an uncoupler. With succinate as substrate captan was found to stimulate state 4 respiration, with the loss of coupled phosphorylation only at higher concentrations of fungicide. The herbicide 2,4-DB appeared to be 5 to 10 times less effective than captan. Both compounds inhibited phosphorylation-coupled succinate oxidation at higher concentrations and malate-coupled phosphorylation at lower concentrations. They acted as inhibitors of NADH-cytochrome c reductase. Both pesticides inhibited noncyclic electron transport in chloroplasts. The rate of ferricyanide reduction in the presence and absence of phosphorylating agents was reduced, and although the rate of ATP generation was reduced also, the P/2e ratio was not changed much under the influence of pesticides. (Author abstract by permission)

76-1717. Audley, B. G.; Archer, B. L.; Carruthers, I. B. (Malaysian Rubber Producers' Res. Assoc., Brickendonbury, Hertford, Hertfordshire, England). **Metabolism of ethepon (2-chloroethylphosphonic acid) and related compounds in *Hevea brasiliensis*.** *Arch. Environ. Contam. Toxicol.* 4(2): 183-200; 1976. (28 references)

Ethephon (I) is used commercially to prolong the flow of latex from the rubber tree after tapping (yield stimulation). The compound is applied to the bark in the region of the tapping cut and the effect on latex flow is due to the ethylene released by chemical decomposition, since gaseous ethylene itself is also a very effective stimulant. When ^{14}C-I is applied to the bark of a young *Hevea* seedling, it is absorbed into the plant by processes which appear to be largely non-metabolic. Ethylene formation commences immediately at the site of application, and the gas is quickly translocated throughout the plant. Translocation of I to all parts of the plant also occurs and the accumulation of ^{14}C in the bark above the zone of application is greater than that below. Chromatographic analysis has shown that compounds other than I remain in the plant tissue. Experiments using ^{14}C-I have shown that detached leaves are able to convert a considerable proportion of the compound to at least twelve non-volatile acid products. One of these is a conjugate of I with an unidentified material. A major component of the products is 2-hydroxyethylphosphonic acid (II), which is itself converted to a number of compounds in leaves. The application of I to bark from mature *Hevea* results in the formation of a single substance which is also a conjugate of I. Neither I nor II is effective in inducing the formation of ethylene from endogenous precursors in vegetative *Hevea* tissue. Ethylene is poorly metabolized by *Hevea* leaves and the evidence available indicates that it is unlikely that any of the compounds produced from I are metabolites of ethylene. (Author abstract by permission)

76-1718. Hietanen, E.; Vainio, H. (Dep. Physiol., Univ. Turku, Turku, Finland). **Effect of administration route of DDT on acute toxicity and on drug biotransformation in various rodents.** *Arch. Environ. Contam. Toxicol.* 4(2): 201-216; 1976. (31 references)

DDT was administered to the guinea pig, mouse, and rat either i.g. or i.p. and to the hamster i.g. in order to investigate variations in the response of hepatic and duodenal drug-metabolizing enzymes to DDT. The intragastric dose (160 mg/kg) was found to produce gastric bleeding and severe tremor in rats and mice but not in other rodents. The hepatic aryl hydrocarbon hydroxylase activity and cytochrome P-450 concentration decreased after the i.g. administration of DDT to rats, mice, and guinea pigs, but in hamsters the activity of aryl hydrocarbon hydroxylase and the cytochrome P-450 concentration increased 12 hr after the dosage. The aryl hydrocarbon hydroxylase activity decreased also in the duodenal mucosa of the rat after the i.g. administration of DDT. The i.p. dose had no effects on the hepatic or duodenal monooxygenase system in 12 hr. The UDP-glucuronosyltransferase activity was slightly lowered in hepatic microsomes of the rat and mouse after the i.g. dose of DDT, but the decrease was more profound when measured after in vitro trypsin digestion of microsomes. The trypsin digestion activated the hepatic UDP-glucuronosyltransferase in all the species studied, i.e., guinea pig, hamster, mouse, and rat (3-, 3-, 5-, and 8-fold, respectively). The duodenal UDP-glucuronosyltransferase activity was not affected by DDT administration in any of the species studied. The results suggest that the acute toxic effects of DDT are species-dependent and the administration route is important in DDT toxicity. The hydroxylation step in drug metabolism is more sensitive to DDT than the glucuronidation step. (Author abstract by permission)

76-1719. Guthrie, F. E.; Domanski, J. J.; Chasson, A. L.; Bradway, D. E.; Monroe, R. J. (Dep. Entomol., North Carolina State Univ., Raleigh, NC 27607). **Human subject experiments to estimate reentry periods for monocrotophos-treated tobacco.** *Arch. Environ. Contam. Toxicol.* 4(2): 217-225; 1976. (18 references)

Thirteen to fifteen human volunteers worked for eight-hr periods in tobacco fields treated 96, 72, and 48 hr previously with monocrotophos (3-hydroxy- *N*-methyl-*cis*-crotonamide dimethyl phosphate). At the 48-hr reentry period, during which time no rainfall occurred, both post-

exposure plasma and red blood cell cholinesterase levels of the worker group were depressed from pre-exposure levels although the decline was less than 9% in both cases. Rainfall in excess of one inch fell during the 96- and 72-hr reentry intervals, and no important change in cholinesterase levels was noted. Experiments with mice were in general agreement with the human tests. Dimethyl phosphoric acid in urine of the worker group collected prior to, and three hr after, exposure was unchanged in all cases. Rain appears to have markedly reduced dislodgable residues. (Author abstract by permission)

76-1720. Tabata, K.; Saito, T. (Lab. Appl. Entomol. Nematol., Fac. Agric., Nagoya Univ., Chikusaku, Nagoya, Japan). **Mechanism of dicofol resistance in spider mites. II: Thin layer chromatographic identification of dicofol metabolism in citrus red mite, *Panonychus citri* McGregor.** *Bochu-Kagaku (Sci. Pest Contr.)* 38(3): 151-155; 1973. (10 references)

^{3}H-dicofol (20 μg) in furfuryl alcohol solution was applied to the isosomes of adult female citrus red mites (*Panonychus citri* McGregor) from dicofol susceptible (WSS) and resistant (WRS) strains. Thirty-two hr later, the dicofol metabolites in the insects were determined using thin-layer chromatography. The chloroform extractable compound in both the susceptible and resistant strains was identified as unchanged dicofol. About 20% of the ^{3}H-dicofol absorbed (40-50% of the applied dose was absorbed by both strains within 32 hr) by the resistant mites was metabolized to a water-soluble compound with an *Rf* value of 0.6-0.7. The *Rf* of this compound did not correspond to that of any of the known dicofol metabolites with which it was compared. The unidentified compound was formed only in small amounts in the susceptible strain. The data indicates that hydrolytic detoxification is a major metabolic pathway of dicofol in WRS.

76-1721. Davison, K. L.; Engebretson, K. A.; Cox, J. H. (U.S. Dep. Agric. Res. Serv., Metab. Radiat. Res. Lab., Fargo, ND 58102). ***p,p'*-DDT and *p,p'*-DDE effects on egg production, eggshell thickness, and reproduction of Japanese quail.** *Bull. Environ. Contam. Toxicol.* 15(3): 265-270; 1976. (6 references)

Female Japanese quail or Pharol D-1 quail were given DDE (0-200 ppm) or DDT (0-40 ppm) in the diet for 12-16 weeks, and the effects on egg production, eggshell thickness, hatchability, and fertility were determined. No evidence suggested that DDE affected the number of eggs laid, egg weight, or eggshell thickness at any dosage level tested. Birds fed 40 ppm DDT and caged in male-female pairs broke more eggs than similarly caged quail fed smaller amounts of insecticide or individually caged quail fed similar amounts of DDT. At no dosage level did DDT detectably reduce eggshell thickness, the number of eggs laid, fertility, or hatchability. However, paired quail laid fewer eggs than did single birds in two experiments, and in one experiment the eggs laid by the paired birds had thinner shells than those laid by the single birds. The data suggests that caged quail are resistant to the eggshell thinning effects of DDT and DDE, but that sexual pairing of caged birds provides sufficient stress to cause detectable reductions in egg production and eggshell thickness.

76-1722. Nye, D. E.; Dorough, H. W. (Univ. Kentucky, Lexington, KY 40506). **Fate of insecticides administered endotracheally to rats.** *Bull. Environ. Contam. Toxicol.* 15(3): 291-296; 1976. (6 references)

^{14}C-labeled carbaryl, leptophos, parathion, and chlordane were administered endotracheally in aerosol form to female Sprague-Dawley rats. In some animals, blood and tissue samples were collected for periods up to 1 hr after administration, and in other animals, the excreta was collected until the excretion of radioactivity ceased. Endotracheal administration resulted in quantitative retention of the inhaled dose. Carbaryl and chlordane residues reached maximum levels within the blood after 2-5 min, then began to decline. Leptophos and parathion accumulated more slowly in the blood and did not dissipate after reaching peak concentrations. Rapid ester hydrolysis was observed in the case of carbaryl, leptophos, and parathion. After 1 hr, the concentration of leptophos and chlordane in the lung was 30 and 24% of the inhaled dose, respectively; the carbaryl and parathion residues were only 1/3 these levels. With carbaryl, parathion, and leptophos, the ^{14}C-acid-labeled residues were lower than the corresponding ^{14}C-alcohol-labeled insecticide; the reverse was true for the liver. Twenty percent of the chlordane dose appeared in the liver, but only trace amounts appeared in the kidney or bladder. Within 3 days, 90% of the administered carbaryl, leptophos, and parathion was eliminated in the urine, and 2-5% of the dose was eliminated in the feces. About 52% of the chlordane dose was eliminated in the feces in 6 days, and 12% was eliminated in the urine.

76-1723. Adams, W. J.; Prince, H. H. (Dep. Fisheries Wildlife, Michigan State Univ., East Lansing, MI 48824). **Mercury levels in the tissues of ring-necked pheasants fed two mercurial fungicides.** *Bull. Environ. Contam. Toxicol.* 15(3): 316-323; 1976. (16 references)

Adult hen and cock pheasants were fed commercial pellets treated with various levels of methylmercury dicyandiamide or phenylmercuric acetate; the treated diets were given every day in some cases and every third day in others. All birds were sacrificed for mercury analysis on day 74 and fecal material was collected on days 10, 18, and 24 from the hens fed the fungicides daily. The tissue mercury concentrations were significantly elevated over control levels in 7 of 9 hens fed an average of 24.7 mg methylmercury dicyandiamade before death; the highest concentrations were found in the kidney and liver and the lowest concentrations were found in the ovary and brain. Among the cocks, there was a positive correlation between the amount of methylmercury dicyandiamide con-

sumed and the mercury content of the kidney, breast muscle, and gonad. The concentration of mercury in the hens fed phenylmercuric acetate increased with the amount consumed; the greatest mercury accumulations occurred in the kidney, followed by the liver, gonad, breast muscle, and brain. Among the cocks, only the renal mercury level was correlated with the amount of phenylmercuric acetate consumed. The total mercury levels in the feces tended to increase as the mercury concentration in the food increased, and the concentration in the feces was significantly greater in the phenylmercuric acetate group than in the methylmercury dicyandiamide group.

76-1724. Ghiasuddin, S. M.; Menzer, R. E. (Dep. Entomol., Univ. Maryland, College Park, MD 20742). **Microsomal epoxidation of aldrin to dieldrin in rats.** *Bull. Environ. Contam. Toxicol.* 15(3): 324-329; 1976. (19 references)

Liver microsomes from sodium phenobarbital-pretreated male Sprague-Dawley rats were incubated in vitro with aldrin and hexane extracts of the preparations and were analyzed by gas chromatography. Extracts from rats which had not been pretreated (induced) with phenobarbital contained both aldrin and dieldrin but the conversion of aldrin to dieldrin was limited despite increases in microsomal protein concentration and incubation time. At longer incubation times and higher protein concentrations the rate of aldrin disappearance usually exceeded the rate of appearance of dieldrin. When microsomes obtained from induced rats were incubated with aldrin, on the other hand, conversion to dieldrin was complete. This indicated that phenobarbital induction increases the oxidative activity of rat liver microsomes, a conclusion which was supported by the fact that induction increased mixed-function oxidase activity. Substrate inhibition was demonstrated when the microsomal protein concentration was increased beyond the optimum value.

76-1725. Wolfe, N. L.; Zepp, R. G.; Gordon, J. A.; Fincher, R. C. (Southeast Environ. Res. Lab., U.S. Environ. Protect. Agency, Athens, GA 30601). ***N*-nitrosamine formation from atrazine.** *Bull. Environ. Contam. Toxicol.* 15(3): 42-347; 1976. (18 references)

Reaction of atrazine with HCl, $NaNO_2$, and water at 27°C yielded 2-chloro-4- (*N*-nitroso-*N*-ethylamino)-6-isopropylamino-*s*-triazine (NNA). The structure of the *N*-nitrosamine product was assigned on the basis of infrared, nuclear magnetic resonance, UV, and mass spectral data. The other possible isomer and the dinitroso derivative expected to result from the *N*-nitrosation of atrazine were not isolated. The maximum rate of formation of NNA occurred at pH 1.8, and the reaction rate increased with the square of the nitrite concentration between 0.01 and 0.1 *M*. Nitrosamine formation in water and foodstuffs containing pesticides such as atrazine plus nitrite would proceed according to pseudo-first-order reaction kinetics. NNA was very stable in water at pH values greater than 4; at lower pH values, the NNA slowly decomposed to atrazine. NNA was rapidly decomposed by light, the major photoproducts of NNA in water being desethylatrazine and atrazine. Near the surface of a body of water, the half-life for the photodecomposition of NNA would be less than 10 min. Thus, sunlight photolysis would probably prevent any build-up of NNA in the aquatic environment, but it is more likely to form in the soil, from which it would be leached into ground waters. These findings, coupled with reports of triazine herbicides in drinking water, suggest a potential carcinogenic hazard due to nitrosamine formation.

76-1726. Whitcomb, E. R.; Santolucito, J. A. (U.S. Environ. Protect. Agency, Environ. Res. Cent., Research Triangle Park, NC 27711). **The action of pesticides on conduction in the rat superior cervical ganglion.** *Bull. Environ. Contam. Toxicol.* 15(3): 348-356; 1976. (13 references)

The preganglionic and postganglionic transmission and the O_2 consumption of the superior cervical ganglion of the adult male Holtzman rat were measured in vitro following the onset of symptoms after oral dosing with chlordane, sevin (carbaryl), DDT, lindane, toxaphene, DFP, parathion, paraoxon, and nicotine. None of the parameters measured suggested that the sodium channels in the nerve membrane were altered after chlorinated hydrocarbon treatment. There was no evidence of spontaneous firing of the preganglionic and postganglionic fibers in Ca ion-free or Ca ion-containing media from animals treated with these compounds. The only significant difference between the chlorinated hydrocarbon group and the nontreated controls was a decreased postganglionic area for the terminal 1 Hz stimulation in the DDT-treated animals. This appeared to be a synaptic transmission effect rather than an axonal transmission effect. The addition of paraoxon in vitro significantly reduced the uptake of O_2 in the superior cervical ganglion and portions of the central nervous system. The data supports the conclusion that no significant inhibition of oxygen uptake occurs in cerebral preparations from animals killed during the first excitatory period of poisoning.

76-1727. Hutson, D. H.; Holmes, D. S.; Crawford, M. J. (Shell Res. Ltd., Tunstall Lab., Sittingbourne Res. Cent., Sittingbourne, Kent, England). **The involvement of glutathione in the reductive dechlorination of a phenacyl halide.** *Chemosphere* 5(2): 79-84; 1976. (8 references)

2,4-Dichlorophen(^{14}C)acyl chloride was incubated with various male rat liver fractions and cofactors. The substrate was stable under phosphate buffer incubation conditions, but reacted spontaneously with GSH and with protein, probably becoming covalently bound in both cases. In the presence of cytosol and GSH, a 41% yield of ketone was obtained, and if NADPH and NADH were added to this reaction, the ketone was enzymatically reduced to the alcohol. Boiled cytosol catalyzed neither ketone production nor ketone reduction, but reacted with the substrate. With cytosol in the absence of GSH, the

substrate was enzymatically reduced to the chlorohydrin; this also was the major reaction observed with washed microsomes and cofactors for mono-oxygenation. Preincubation of substrate with GSH produced phenacylglutathione; the reaction proceeded to the ketone when dialyzed cytosol was added. 2,4-Dichlorophenacyl mercapturic acid and 2,4-dichlorophenacyl-cytosol protein were not substrates for the reaction. Reaction of 2,4-dichlorophenacyl mercapturic acid and *N*-acetyl-*L*-cysteine in ethanol treated with sodium produced the ketone.

76-1728. Kamataki, T.; Lee Lin, M. C. M.; Belcher, D. H.; Neal, R. A.* (Cent. Environ. Toxicol., Dep. Biochem., Vanderbilt Univ. Sch. Med., Nashville, TN 37232). **Studies of the metabolism of parathion with an apparently homogeneous preparation of rabbit liver cytochrome P-450.** *Drug Metab. Disposition* 4(2): 180-189; 1976. (32 references)

The metabolism was studied of parathion by an apparently homogeneous preparation of cytochrome P-450 isolated from the livers of phenobarbital-pretreated male New Zealand rabbits. This preparation, in the presence of the appropriate cofactors, was able to catalyze the conversion of parathion to both paraoxon and diethyl phosphorothioic acid. Parathion was also metabolized by the rabbit reconstituted mixed-function oxidase system to diethyl phosphoric acid, a product which had previously been thought to arise exclusively from the hydrolysis of paraoxon by microsomal esterase(s). The data suggests that all three products of the metabolism of parathion by the reconstituted mixed-function oxidase system are formed nonenzymatically via breakdown by different pathways of a common enzymatically formed intermediate. This common intermediate is thought to be the sulfine derivative of parathion formed in the mixed-function oxidase-catalyzed addition of an oxygen atom to one of the unshared electron pairs of the thiono-sulfur atom.

76-1729. Anonymous. **Dehydrogenation of lindane.** *Drug Metab. Disposition* 4(2): 195-196; 1976. (2 references)

It is difficult to account for the formation of all the known metabolites of lindane via its dehydrohalogenation to γ-pentachlorocyclohexane, the proposed first step in its mammalian metabolism. Recent evidence indicates that the enzyme system catalyzing the dehydrogenation of lindane is localized in the microsomes of rat liver, that it requires molecular O_2 and a NADPH-generating system which could be only partially replaced by NADH, and that it is inhibited by SKF 525-A and CO but not by cyanide. The reaction therefore appears to be a mixed-function oxidation different from the fatty acid desaturase system. The dehydrogenation was increased in liver microsomes after pretreatment of rats with DDT. Additional evidence indicates that the formation of hexachlorocyclohexene could be an important first step in a major pathway of lindane metabolism. An oxenoid mechanism for the abstraction of two hydrogen atoms by cytochrome P-450 is proposed for lindane metabolism.

76-1730. Suzuki, T.; Takeda, M.; Uchiyama, M. (Natl. Inst. Hyg. Sci., Minist. Health and Welfare, Tokyo, Japan). [**Microbial metabolism of *N*-methylcarbamate insecticide. V. Inhibitory action of the oxidative metabolites of BPMC (*o*-*sec*-butylphenyl *N*-methylcarbamate) on bovine erythrocyte and mouse serum cholinesterase.**] *Eisei Kagaku (J. Hyg. Chem.)* 21(6): 330-332; 1975. (8 references) (Japanese)

Seven compounds presumably formed in the environment by microbial metabolism of *o*-*sec*-butylphenyl *N*-methylcarbamate (BPMC) were tested to determine their inhibitory action on serum cholinesterase activity and on calf erythrocyte cholinesterase. The metabolites were: *o*-*sec*-butylphenyl *N*-hydroxymethyl carbamate; *o*-*sec*-butylphenyl carbamate; *o*-(3-hydroxy-1-methyl propyl) phenyl *N*-methylcarbamate; *o*-(2-hydroxy-1-methyl) phenyl *N*-methylcarbamate; and *o*-(2-carboxyl-1-methylethyl) phenyl *N*-methylcarbamate. The results showed that none of the presumed metabolites were more active in cholinesterase inhibition than the parent compound, thus indicating that metabolism proceeds along the lines of detoxification. The relative inhibitory action of the metabolites to true- and pseudo-cholinesterase were similar.

76-1731. Kutsenko, S. A. (S. M. Kirov Military Medical Academy, Leningrad, USSR). **Povyshenie antikholinesteraznoy aktivnosti khlorofosa pri vzaimodeystvii ego s reaktivatorom TMB-4 in vitro.** [**Heightened anticholinesterase activity of chlorophos in its interaction in vitro with the TMB-4 reactivator.**] *Farmakol. Toksikol. (Moscow)* 39(1): 35-39; 1976. (18 references) (Russian)

In vitro studies have demonstrated that a thermostatic treatment of an aqueous chlorophos (trichlorfon) solution at 38°C is attended by increased cholinesterase activity. The process is much faster in an alkaline medium. Joint incubation of chlorophos with the TMB-4 reactivator at pH 7.5 and 38°C not only resulted in no decomposition of the poison, but instead speeded up the progressive accretion of the inhibitory properties of this organophosphorus compound. It is suggested that the data from this study points to the formation during direct interaction of TMB-4 with chlorophos or the product of its transformation of a stable complex appearing to be a powerful anticholinesterase aENT.

76-1732. Krolikowska-Prasal, I. (Dep. Histol. Embryol., Inst. Biol. Morphol., Med. Acad. Lublin, Poland). **Histochemical studies on the gastric epithelium and glands in guinea pigs subjected to the action of a fungicide (captan).** *Folia Morphol. (Warsaw)* 33(4): 427-435; 1974. (19 references)

Male and female guinea pigs were given captan (100 or 1000 mg/kg/day) by stomach tube for 7 or 21 days. All animals given 1000 mg/kg died within 10-12 days. In the animals given 100 mg/kg for 7 days, the activity of acid phosphatase was increased in the epithelial and parietal cells of the gastric fundus, alkaline phosphatase was increased in the endothelial cells of the fundic blood vessels, glucose-6-phosphate dehydrogenase (G6PDH) was decreased in the epithelial cells, isocitrate dehydrogenase (ICDH) was increased in the cylindrical epithelial cells, and lactate dehydrogenase (LDH) was increased in the gastric epithelial and gland cells. The mucus cells gave a strongly positive PAS reaction. The changes were more pronounced in the animals given 100 mg/kg for 21 days. The respiratory enzymes, particularly succinate dehydrogenase (SDH) and ICDH, and NADH and NADPH tetrazolium reductase were increased in the parietal cells, and ICDH was increased in the chief cells. Acid phosphatase was also increased in the parietal cells, whereas the activities of SDH, ICDH, and G6PDH were decreased in the cylindrical epithelial cells. After treatment with 1000 mg/kg captan for 7 days, the parietal cell activities of all respiratory enzymes except G6PDH were increased, and the reaction for neutral mucopolysaccharides was strongly positive in the mucocytes. Thus, the parietal cells of the glandular fundus were most sensitive to the action of captan, followed by the cylindrical epithelial and gastric pit cells.

76-1733. Araki, Y.; Tanaka, K. (Dep. Pharmacol., Fac. Med., Kyushu Univ., Fukuoka, Japan). [**Potentiation of enzyme-inducing activity of PCB by DDT or BHC.**] *Fukuoka Igaku Zasshi (Fukuoka Med. J.)* 65(1): 65-68; 1974. (18 references) (Japanese)

The potentiation of enzyme-inducing activity of PCB by DDT or β-BHC was studied using CF-1 strain female mice. The reduction of hexobarbital sleeping time was used as the indicator for the hepatic enzyme-inducing activity. The mixture of PCB and DDT or BHC was administered into the mouse stomach by a metal sound and the sleeping time with hexobarbital-Na injection into the stomach was then measured over a 21 day period. The amount of PCB and DDT used was the combination of each of the minimum effective doses and its 50% or 25% dose. The amount of PCB and BHC used was the combinations of each of the minimum effective dose and its 50%, 25%, or 20% dose. The minimum effective dose of PCBs, DDT, and β-BHC were 20, 200, and 100 mg/kg, respectively. After administration of a mixture of PCB 20 mg/kg and DDT 200 mg/kg, the sleeping time was reduced to 44% of that of the control group after 2 days of administration, and this reduction was greater than that achieved by the single application of PCB 50 mg/kg or DDT 350 mg/kg. The reduction after 7 days and 14 days was 63% and 89% of the sleeping time of the control group, respectively. The sleeping time recovered to the level of the control group after 21 days. After administration of the mixture of PCB 5 mg/kg and BHC 25 mg/kg, the sleeping time after 2, 7, and 14 days was 65, 70, and 92% of that of the control group, respectively. This was comparable to the effect observed with the single dose of PCB 50 mg/kg, and was larger than the effect observed with the single dose of BHC 200 mg/kg.

76-1734. Verma, S. R.; Gupta, S. P.; Tyagi, M. P. (Pollution Res. Unit., Dep. Zool., D.A.V. Coll., Muzaffarnagar, India). **Studies on the toxicity of lindane on *Colisa fasciatus* (Part I: TLm measurements and histopathological changes in certain tissues).** *Gegenbaurs Morphol. Jahrb. Leipzig* 121(1): 39-54; 1975. (22 references)

Colisa fasciatus were exposed for 12-96 hr to lindane 20% E.C. dissolved in the aquarium water. The median tolerance limit (TLm) values were 0.87, 0.78, 0.68, and 0.64 mg/liter at 17-20°C and 0.60, 0.56, 0.46, and 0.41 mg/l for 32-35°C at 12, 24, 48, and 96 hr, respectively. In both temperature ranges, the survival rates at different concentrations and times were significant at the 1% and 5% level; the difference in survival rates at the different temperatures was statistically insignificant. Lindane exposure produced characteristic histopathological changes in the gills, liver, and kidneys. In the gills, there was a loss of respiratory and blood cells, the blood vessels were atrophied, the outer membrane of the gill lamellae was ruptured, and the tips of the gill filaments were ruptured. The outer membrane of the liver was also ruptured, some hepatic cells were vacuolated or completely degenerated, and a large splitting of the tissues inside the liver was observed. The outer renal epithelium, parenchymatous cells of the renal tubules, and cuboidal cells of the uriniferous tubules showed degeneration; large spaces were formed within the renal tissue.

76-1735. Malepszy, S.; Eberhardt, J.; Maluszynski, M. (Inst. Plant Genet., Polish Acad. Sci., Poznan, Poland). **Mutagenic effects of NMH, NEH, and HM in barley.** *Genet. Pol.* 14(1): 47-59; 1973. (14 references)

A study was made to reveal mutagenic activity of nitrosamides holding different alkyl groups. Spring barley grains were presoaked for 8 hr in water and then treated with *N*-nitroso- *N*-methylurea (NMH), *N*-nitroso-*N*-ethylurea (NEH), and maleic hydrazide (HM) solutions for 5 hr. The grains were planted in the field and in the breeding chamber. Concentrations of NMH for the laboratory trials were 0.4, 0.8, 1.2, 1.5, 2.0, and 2.6 mm; for the field trials, 0.4, 0.8, and 1.2 mm. Concentrations of NEH for the laboratory trials were 2.0, 3.0, 4.0, 5.0, 6.0, and 7.0 mm; for field trials, 2.0, 3.0, and 4.0 mm. Concentrations of HM used for laboratory trials were 0.4, 0.8, 1.2, 2.0, 4.0, and 8.0 mm; for field trials, 0.4, 0.8, and 1.2 mm. NMH and NEH delayed germination notably, yet without affecting the final number of germinated seeds. HM did not impede the process of germination. In field trials the number of germinating seedlings depended on the concentration of mutagen used. Of the 3 mutagens applied, HM reduced survival rate negligibly. HM-induced chlorophyll mutation spectrum differed essentially from

the spectrum due to urea derivatives. NMH had the highest mutagenic efficiency and effectiveness.

76-1736. Breccia, A.; Gattavecchia, E.; Albonetti, G.; Di Pietra, A. M. (Ist. Chim., Fac. Farm., Univ. Bologna, Bologna, Italy). **Radiobiochemistry of phytodrugs: I. Role of juvenile hormones and analogs in the biosynthesis of proteins and RNA in drosophila larvae.** *J. Environ. Sci. Health* B11(1): 1-7; 1976. (11 references)

A study was made of the effect of juvenile hormone and its analogs such as Altosid (methoprene) and Altozar (ZR-512) on the biosynthesis of proteins and RNA in subcellular preparations of drosophila larvae with leucine-U-^{14}C and uridine-2-^{14}C, respectively. The incorporation of leucine-U-^{14}C into the proteins decreased progressively from the crude homogenate to the microsome-free subcellular fraction. This suggests a positive action of the metabolites, mainly the acetyl unit, arising from juvenile hormone and its analogs on the protein biosynthesis, compared with a reduction of leucine incorporation for the whole molecules. In the mitochondria-free subcellular fraction, the incorporation of uridine-2-^{14}C increased in the presence of juvenile hormone and Altozar, but decreased with Altosid, compared to the test controls, but in all these cases the incorporation was higher than in the crude homogenate.

76-1737. Owen, W. J.; Rogers, L. J.; Hayes, J. D. (Dep. Biochem., Royal Holloway Coll., Univ. London, Englefield, Surrey, England). **Inhibition of Hill reaction and photophosphorylation by 1,1,1-trichloro- 2,2-bis (*p*-chlorophenyl) ethane.** *J. Exp. Bot.* 26(94): 692-701; 1975. (25 references)

The effect of DDT was studied on the photoreduction of DCIP and ferricyanide and on the associated cyclic and noncyclic photophosphorylations using 30 varieties of barley from different parts of the world. Seedlings were sprayed with 0.1% technical DDT. The isolated chloroplasts from these plants were placed in 1-cm light path cuvettes which contained DCIP or potassium ferricyanide and illuminated for 30 or 60-sec intervals. Whereas DDT-resistant barleys were not affected by DDT treatment, chloroplasts from susceptible DDT-treated barleys showed parallel inhibitions of all the investigated aspects of photosynthesis. However, in a few susceptible varieties, inhibitions of ferricyanide photoreduction or noncyclic photophosphorylation were not so pronounced. The effects on the susceptible barleys were probably exerted through interaction with a membrane component. Earlier reports that DDT had no effect on photosynthetic activities of susceptible barleys may have been due to the use of hypotonic media during chloroplast isolation.

76-1738. Livingston, J. M.; Goodwin, J. T. (USAF Environ. Health Lab., Kelly AFB, TX). **The effect of ultra low volume aerial dispersal of naled on an aquatic habitat.** *Natl. Tech. Inform. Serv.*, AD-787 653, 1974, 25 p. (6 references)

Ultra low volume aerial applications were made of naled (Dibrom 14) at 0.75 and 1.5 oz/A. Caged fish, shoreline sampling, drift traps, drop traps, acetylcholinesterase levels in fish brain, and other techniques were used to monitor the effects of the spray on non-target aquatic organisms. The results of this study indicate that there are negligible gross environmental hazards associated with the application of this compound at the rates of 0.75 and 1.5 oz/A. It is felt that this is due to the rapid degradation of the compound in an aquatic situation. Aquatic insects, flying non-dipterous insects, fish, reptiles, and birds did not appear affected by naled at these rates. A significant depression of brain AChE activity was noted at both rates. Recovery required about 4 weeks. This slow recovery can be significant if fish are subjected to multiple exposures over a short period of time as the inhibitory affects on AChE are additive. It is concluded that the short term effects of naled on an aquatic habitat are negligible.

76-1739. Danon, J. M.; Karpati, G.; Carpenter, S.; Wolfe, L. S. (Montreal, Quebec, Canada). **Experimental myotonic myopathy.** *Neurology* 26(4): 384; 1976.

2,4-D, administered t.i.d. i.p. to mature Sprague-Dawley rats and Hartley guinea pigs at a total daily dose of 200-300 mg/kg, rendered the animals myotonic for most of the day. Marked morphologic changes were seen in the proximal limb muscles after 5 days of treatment. In the biceps brachii, these changes included prominent streaming of the Z disk, accumulation of neutral fat droplets in non-necrotic cells, an abundance of vesicular profiles probably deriving from the sarcoplasmic reticulum, and muscle cell necrosis and phagocytosis, as well as regeneration. The myopathic changes correlated directly with the cumulative duration of the myotonia. The 2,4-D concentration in the muscle tissue was 16.3 μg/g wet weight as free acid 2 hr after injection. Preliminary data suggests that 2,4-D also becomes esterified in glycerides of the muscle cells. This may impair the intracellular release of fatty acids from glycerides and could therefore lead to defects in membrane structure and function as well as energy metabolism of the muscle cells.

76-1740. Uchiyama, M. (Natl. Inst. Hyg. Sci., Tokyo, Japan). [**Chemical substances and their toxicity. Action and responses of agricultural pesticides in living organisms.**] *Nippon Noyakugakkai Shi* 1(1): 49-56; 1975. (26 references) (Japanese)

Studies on various aspects of pesticide toxicology are reviewed. The "true tolerance amount" of a harmful material is defined as the amount which produces no irreversible abnormality in man. This and the necessity of understanding the tolerance amount, which depends on the response of living organisms, are discussed. A description is given of three major responses—metabolism, immunization, and endocrine. Immunization, car-

cinogenesis, and co-carcinogenesis are especially important in studying organophosphorus pesticides. It is suggested that the gap between experimental animals and human beings cannot be overcome by experiments and that the safety of pesticides can only be verified to a certain extent. Though it seems impossible to live without using pesticides, it is recommended that one should avoid specific pesticides which are unmanageable by man.

76-1741. Omiya, A.; Nakai, K. (Akita University, Akita, Japan). [**Distribution, metabolism, and excretion of ^{14}C-DDT in mice.**] *Nippon Yakurigaku Zasshi (Jpn. J. Pharmacol.)* 70(2): 14; 1974. (Japanese)

The distribution, metabolism, and excretion of DDT were studied using ^{14}C-labeled DDT in male mice. One μCi/mg ^{14}C-DDT was administered into the mouse stomach and the stool and urine were collected every 12 hr. Tissue samples from various organs were also collected. The tissue and stool samples were dissolved in NCS or PCS solubilizer and radioactivity was measured with a liquid scintillation spectrometer. Ether extraction was done on the urine sample as well as the tissue samples, and the extracted material was separated by thin layer chromatography and the distribution of the radioactivity determined with a radiochromatoscanner. The serum radioactivity after 7 days of DDT administration was equivalent to 1.3 μg/ml, DDT and the radioactivity in heart and lung was 2-5 times more than the serum radioactivity, while that in muscle, small intestine, and liver was 8-11 times that, and the radioactivity in fatty tissue was 360 times that. The radioactivity in urine per day was equivalent to about 0.3% of the dosed DDT, and the cumulative amount of radioactivity discharged in the urine for 9 days was 2.7% of the dosed DDT. About 3% of the radioactivity from the administered DDT was discharged in the stool per day; the 9 day cumulative amount was 26.5%. Most of the radioactivity in fatty tissue and small intestine was to have come the unchanged DDT. The radioactivity in urine was assumed mostly from DDA, and a 13% contribution to the observed radioactivity by DDE was detected. The distribution and excretion of DDT were also compared in a similar experiment done on mice which were not fed for 2 days before DDT administration. The DDT concentration in the individual tissues of these mice (except in muscle and small intestine) increased 2-3 time more extensively than that of the fed mice. The DDT excretion in stool decreased to 13% of that of the fed mice. The excretion in urine increased; however, the total excretion was 50% less than that in the fed mice.

76-1742. Smith, M. S.; Weeraratna, C. S. (Wye Coll., Univ. London, Ashford, Kent, England). **Influence of some biologically active compounds on microbial activity and on the availability of plant nutrients in soils. IV. Nitrapyrin, dazomet, 2-chlorobenzamide, and tributyl-3-chlorobenzylammonium bromide.** *Pestic. Sci.* 6(6): 605-615; 1975. (18 references)

The effect of the nitrification inhibitor nitrapyrin (2-chloro-6- trichloromethylpyridine), the soil partial sterilant dazomet (tetrahydro-3,5- dimethyl-1,3,5-thiadiazine- 2-thione), the quaternary ammonium growth retardant tributyl-3- chlorobenzylammonium bromide, and the pre-emergent herbicide 2-chlorobenzamide on total microbial activity and available plant nutrient content of an acid and an alkaline soil during an incubation period of 6 weeks under aerobic conditions has been studied in comparison with untreated soils. The compounds were incorporated with the soils at normal application rates. At intervals determinations were made of carbon dioxide liberated and the contents of ammonium and nitrate nitrogen and of some available plant nutrient mineral elements. All four compounds were found to influence these quantities. Nitrapyrin increased carbon dioxide production throughout and dazomet did so after initial depression. 2-Chlorobenzamide and the growth retardant reduced carbon dioxide liberation especially in the early stage of incubation. All the compounds retarded nitrification in both soils; an increase in ammonium nitrogen resulted in treated soils except in the alkaline soil containing the growth retardant, where ammonification was also reduced. A reduction in the content of available mineral nutrient elements was usually found suggesting interference with the biological oxidation of these elements to less available forms. However, available manganese was increased by dazomet, as were available iron and manganese by the growth retardant and 2-chlorobenzamide. (Author abstract by permission)

76-1743. Munnecke, D. E.; Moore, B. J. (Univ. California, Riverside, CA 92502). **Inactivation of methylmercury dicyandiamide by *Penicillium* in soil and the relationship to damping-off of peas.** *Pestic. Sci.* 6(6): 629-638; 1975. (8 references)

In laboratory experiments, autoclaved University of California (UC) soil mix containing 5-20 mg of methylmercury dicyandiamide (MMDD)/g of soil was infested with *Penicillium notatum*. Bioassays were made at intervals up to 63 days later to detect the fungicide's rate of inactivation. The culture of *P. notatum* had been adapted to grow in the presence of high MMDD concentrations in an agar medium. Relationships among initial MMDD concentration, presence of *P. notatum*, and incidence of damping-off of peas caused by *Pythium ultimum* were determined. (Author abstract by permission)

76-1744. Vizek, M.; Holusa, R.; Palecek, F. (Dep. Pathol. Physiol., Fac. Paediatr., Karlovy Univ., Prague, Czechoslovakia). **Lung function in acute paraquat intoxication.** *Physiol. Bohemoslov.* 24(6): 559-564; 1976. (15 references)

Paraquat (0.5 mg/kg) was injected intratracheally into adult male Wistar rats, and the lungs were examined functionally and morphologically 48 hr later. Pronounced tachypnea was observed (235 c/min), and it persisted

under urethane anesthesia (210 c/min). In control animals, the mean breathing rate was 115 and 90 c/min in awake and anesthetized rats, respectively. The rate of breathing decreased to control levels in the paraquat treated rats after bilateral cervical vagotomy. The functional residual lung capacity was significantly increased in the herbicide-treated rats, but this parameter also returned to control values after vagotomy. Histologically, the paraquat-induced disorder was characterized by the focal formation of hyaline membranes and edema with occasional hemorrhages and signs of inflammation.

76-1745. Pont, V.; Jarczyk, H. J.; Collet, G. F.; Thomas, R. (Station Federale de Recherches Agronomiques, Lausanne, Switzerland). **Identification de metabolites du dimethyl-1,3- (benzothiazolyl-2)-3-uree et etude de sa stabilite in vitro. [Identification of 1,3-dimethyl- 3(2-benzothiazolyl) urea metabolites and study of their stability in vitro.]** *Phytochemistry* 13(5): 785-792; 1974. (French)

Structures of some metabolites of methobenzthiazuron (MBT) obtained by hydroponic culture have been determined in various plants. It is possible to isolate 1-hydroxymethyl-3 -methyl-3- (2-benzothiazolyl)-urea which represents the first step in the urea chain degradation. While the loss of the hydroxymethyl group produces a second metabolite, condensation at that level with a glucose molecule is an example of another way to physiological neutralization. The synthesis of other possible derivatives of MBT has only led to the discovery of a few still unknown metabolites. The reaction of MBT to UV light was also examined. In general, the loss of radioactivity during the various tests rose to 8-9%.

76-1746. Tang, H. V.; Truong, H. M. (Dep. Sci. Sol, Univ. Catholique de Louvain, Louvain La Neuve, Belgium). **Cinetique et electrocinetique de l'absorption du 2,4-D et 2,4,5-T par les plantes intactes de riz. [Kinetics and electrokinetics of 2,4-D and 2,4,5-T absorption by undamaged rice plants.]** *Plant Soil* 43(3): 671-679; 1975. (11 references) (French)

The experimental results of the absorption of herbicides at increasing doses by undamaged rice plants were interpreted by the classical enzymatic theory of Michaelis-Menten and by the recent electrokinetic formation of Thellier. The former is characterized by a hyperbolic equation from which the maximum speed *V*m and the *K*m constant for 2,4-D can be derived. However, with 2,4,5-T, the absorption curve is dual since the herbicide has two transport mechanisms according to Epstein; there are thus two *V*ms and two *K*ms. For the graphic representation of the results for both herbicides, the Thellier electrokinetic formalism was utilized. There is a linear relation between V and log (S) for the lowest concentrations of herbicides (S); the curve then significantly deviates from the straight line; this is indicative of a non-ohmic behavior of the absorption mechanism analogous to that of a semiconductor.

76-1747. Cegla, U. H.; Kroidl, R. F.; Kronberger, H.; Weber, H. (Sekt. Pulmonol., Zent. Innere Med., Kinderheilkd. Univ., 79 ULM/Donau, Germany). **Tierexperimentelles Modell einer Lungenfibrose bei der Ratte mittels Paraquatinjektion. [An experimental animal model of lung fibrosis in the rat by injection of paraquat.]** *Pneumonologie* 152(1-3): 65-74; 1975. (17 references) (German)

An experimental model of lung fibrosis is available through multiple i.v. injections of the herbicide paraquat. Rats weighing 150-180 g were injected i.p. with 0.9% saline diluted 20% paraquat solution to give 15-30 mg/kg body weight. Of five rats receiving 20 mg/kg three died in one day. All five receiving 15 mg/kg survived. After eight days, these had a well pronounced thickening of the alveolar septum through infiltration by plasma cells, lymphocytes, monocytic cells, and some histiocytes. This thickening reached its maximum in the second week and started diminishing in the third week. After 52 days the lungs were quite normal. When four injections of 5 mg paraquat/kg body weight each were given spaced over one week, Sprague-Dawley rats developed lung fibrosis.

76-1748. Wierzbicka, M. (Dep. Bioenerg. Bioprod., Nencki Inst. Exp. Biol., Warsaw, Poland). **Haemolymph concentration in Cyclopoida copepodids during active and resting stage and the effect of 2,4-D sodium salt.** *Pol. Arch. Hydrobiol.* 21(2): 269-273; 1974. (15 references)

A study was made to ascertain whether under extreme conditions of life and following changes in metabolism of organisms certain osmotic changes also occur in the body fluid of copepodids. The Δ°C value in Cyclopoida copepodids collected from plankton in their active stage was 0.62. In copepodids awakened from their resting stage in bottom sediments containing hydrogen sulfide, the value was much lower, ranging from 0.24 to 0.28. In experiments using 2,4-D sodium salt the values for copepodids at the resting stage were higher and approached those observed in their plankton life. It is noted that the examined copepodids awakened from their resting stage did not show any sensitivity to the effects of 2,4-D sodium salt. No death or locomotor disturbances were found. The same lack of sensitivity was also noted in copepodids IV of *C. strenuus* Fisch. awakened from their resting stage in bottom sediments. The results of this study suggest that the resting stage and 2,4-D sodium salt have an effect on physiological mechanisms regulating osmotic pressure in the body fluids of *Copepoda cyclopoida*.

76-1749. Wierzbicka, M. (Dep. Bioenerg. Bioprod., Nencki Inst. Exp. Biol., Warsaw, Poland). **Influence of 2,4-D sodium salt on the survival of some copepoda species.** *Pol. Arch. Hydrobiol.* 21(2): 275-282; 1974. (6 references)

The effects of 2,4-D sodium salt were studied in two thoroughly different stages in the life cycle of Cyclopoida, i.e., an active one in plankton and a resting one in bottom sediments of water bodies. Concentrations of 2,4-D used

were 2.5, 5.0, 10.0, 15.0, and 20.0 m*M*/l. The experiments showed a high sensitivity of *C. strenuus* active specimens from plankton and especially of nauplii and copepodids I-IV, inclusively, locomotor disturbances characteristic of a preagonal state were noted. *E. graciloides* specimens showed symptoms of locomotor disturbances and their mortality rate was much higher. The critical concentration for both species was 10.0 m*M*/l. Copepodids IV of *C. strenuus* and copepodids IV and V of other species of Cyclops O. F. Muller genus, awakened from the resting stage, were completely insensitive to the 2,4-D. No cases of locomotor disturbances were noted.

76-1750. Whitacre, D. M.; Schwemmer, B. A.; Schulz, K. L. (Velsicol Chem. Corp., Chicago, IL 60611). **The fate of the phosphonothioate insecticide leptophos in plants and animals.** *Proc. North Cent. Branch Entomol. Soc. Am.* 26: 146-147; 1974.

The metabolic fate of ^{14}C-leptophos was studied in tomatoes and lettuce. Major pathways were also elucidated for other plants. This moiety is very stable against enzyme attack in these plants. In all plants the parent leptophos was the major residue at almost all intervals up to and exceeding 30 days. Also present in small amounts were: leptophos oxon; 3-bromo-2,5- dichlorophenol; *O*-methyl phenylphosphonothioic acid; *O*-methyl phenylphosphonic acid; and phenyl phosphonic acid. The specific quantities of these metabolites varied with the plant species and the interval between treatment and harvest. Generally, the polar metabolites resulting from hydrolysis of the phenoxy bond were not associated with biological materials except in the case of 4-bromo-2,5-dichlorophenol which was present as a salt or conjugate in small amounts in some cases. Leptophos was metabolized rapidly in rats. The majority of an administered dose is rapidly excreted in the urine while the bulk of the remainder is eliminated in the feces. Major metabolites were the combined phenyl phosphonic acids and the 3-bromo-2,5-dichlorophenol. After metabolism in mammals relatively little leptophos or oxon remained intact.

76-1751. Franco, R.; Filippone, E. J.; Majumdar, S. K. (Dep. Biol., Lafayette Coll., Easton, PA 18042). **Teratologic evaluation of hexachlorophene in mice.** *Proc. Pa. Acad. Sci.* 48: 158; 1974.

The effects of hexachlorophene on the fetuses of STS mice were studied. Hexachlorophene was given to the pregnant mice during oncogenesis (s.c., on days 3-8, 7-12, or 11-16 of gestation at 12.5, 25, and 50 mg/kg/day). On the 19th day after drug administration the females were sacrificed and fetuses examined for viability and external abnormalities. Records were made of implantations and resorptions. All concentrations used increased fetal resorption and mortality. No teratogenic effects were noted.

76-1752. Rosalki, S. B. (Dep. Diagnostic Chem. Pathol., St. Mary's Hosp., London, England). **Uses and limitations of enzyme tests.** *Proc. R. Soc. Med.* 67: 633-637; 1974. (53 references)

Enzyme tests may be used in the identification of genetic susceptibility to disease, the identification of the carrier state of genetically determined disease, the detection of unsuspected disease by population testing, confirmation of suspected disease at a preclinical or subclinical stage, confirmation of clinically suspected disease, the organ-localization of disease, the characterization of organ pathology, detection of the action of toxic agents, the detection of malignant disease, assessment of the therapeutic response, and assessment of disease prognosis. Enzyme tests are useful, however, only if their limitations are known. Limitations imposed by the state of the patient include the patient's genetic status, sex, and exercise status, as well as the circadian variations shown by some enzymes. Limitations imposed by the condition of the sample include hemolysis, the presence of antiocoagulants used in plasma collection, and sample storage. There are also technical, enzymological, and interpretive limitations.

76-1753. Davis, M. (Liver Unit, King's Coll. Hosp., London, England). **Enzyme induction by environmental agents.** *Proc. R. Soc. Med.* 67: 642; 1974. (10 references)

Many compounds present in the environment, including some insecticides, are able to induce the hepatic microsomal enzymes which are concerned with the detoxification of foreign chemicals and the metabolism of endogenous compounds such as corticosteroids. Although enzyme induction may be regarded as a beneficial adaptive response, chronic exposure to enzyme-inducing agents may lead to severe metabolic disorders, such as osteomalacia. The urinary excretion of D-glucaric acid was used as a screening test for enzyme induction in the investigation of such problems. Environmental exposure to DDT and other insecticides with enzyme-inducing properties causes increased excretion of urinary D-glucaric acid, and studies in human volunteers have shown that urinary D-glucaric acid excretion predicts increased rates of drug metabolism. The estimation of urinary D-glucaric acid is simple and advantageous in that it involves only a 24-hr urine collection from the subjects being investigated.

76-1754. Gardiner, T. H.; Schanker, L. S. (Dep. Pharmacol., Univ. Missouri Kansas City, Kansas City, MO). **Effect of paraquat-induced lung damage on permeability of rat lung to drugs.** *Proc. Soc. Exp. Biol. Med.* 151(2): 288-292; 1976. (15 references)

Absorption 3 drugs from the paraquat-damaged is described quantitatively lung. The drugs include an acid, a base, and a quaternary ammonium compound. Lung damage was produced in male Charles-River rats by paraquat dichloride (250 mg/kg, p.o.). By the end of the 3rd day after administration of paraquat dichloride evidence of hemorrhage began to appear, and perivascular edema together with the first signs of tissue inflammation were seen. After

5-8 days lungs from paraquat-treated rats were greatly enlarged, and nearly the entire lung surface had taken on a dark brownish-red color indicative of severe hemorrhage and congestion. Edema and inflammation worsened, leaving little functional tissue for pulmonary gas exchange. By the 15th day, the lungs from surviving paraquat-treated rats appeared normal again with the exception of a slight hyperemia. The permeability of the lung to drugs was markedly increased in the presence of paraquat-induced damage. Pulmonary absorption rates for the 3 compounds studied were increased by 1.4-2.8 times in paraquat-treated animals. The 60 min absorption of the quaternary amine, procaine amide ethobromide HBr (PAEB) (10 m*M*), was 35-45% of the administered dose in controls, but rose to 90-96% in treated rats. Similarly, absorption of the organic anion *p*-aminohippuric acid (PAH) rose from 40-50% to 92-97% on the third to eighth day after paraquat dosing. Absorption of the lipid-soluble tertiary amine procaine amide was also increased but not to such a great extent. An increase in the membrane porosity in paraquat-damaged lungs could account for this increase in the drug absorption rates. However, it is possible that other factors are also involved.

76-1755. Gromisz, Z. (Dep. Apiol., Gorna Niwa, Poland). **Szkodliwosc dla pszczol preparatu Bi-58 w nektarze jabloni. [Toxicity to honeybees of the insecticide Bi-58 in nectar of apple trees.]** *Pszczelnicze Zesz. Nauk.* 17: 191-196; 1973. (7 references) (Polish)

Toxicity to honeybees of the insecticide Bi-58 (dimethoate) was studied during the years 1969-1971. The insecticide was applied to apple trees from which the bees drew nectar. When Bi-58 was applied to the trees before blooming time, the chemical diffused into the nectar and became toxic to honeybees. The degree of its toxicity depended on the length of time between application and exposure of the bee. Bees fed with nectar taken from flowers 5 to 6 days after application suffered 100% mortality. Mortality of bees fed with nectar taken 9 to 12 days after application of the insecticide was similar to that in control groups.

76-1756. Niemczuk, R. (Dep. Vet. Hyg., Wroclaw, Poland). **Dzialanie niektorych herbicydow na pszczoly. [Influence of some herbicides on honeybees.]** *Pszczelnicze Zesz. Nauk.* 17: 205-227; 1973. (43 references) (Polish)

The effects were studied of 13 herbicides on honey bees of different ages. A total of 57,600 bees were involved in the experiments. Herbicides were applied freshly or after 24 and 48 hr of open air exposure. The chemicals were given to the bees with food or the bees were treated topically with the vapors. Doses ranged from 0.25 to 3 g of herbicide in 1 liter 50% sucrose solution. The fresh herbicides were more toxic than the exposed ones. Nervous system effects were noted in bees treated topically or with vapors. Chwastoks 30 and 80% were only toxic to bees when used as a fresh solution of 1 g/l liter of sugar syrup. Aminopielik, Pielik, Dikonirt, Embutox, and Tropotox were toxic in solutions of 2 g. Aretit, Hermot, Krzewotox, Leuna M, and Pielik E were toxic even at the smallest doses. Only Lironox was not toxic to bees. It is concluded from the results of this study that all the investigated herbicides should be applied only after open air exposure and in doses which are not toxic to bees. Spraying should be done at the time when the bees are not flying and when plants are not in bloom.

76-1757. Robinson, J. (Tunstall Lab., Shell Res. Ltd., Sittingbourne, Kent, England). **Mathematical models in ecochemistry.** *Pure Appl. Chem.* 42(1-2): 139-153; 1976. (26 references)

General concepts concerning models and their logical and analogical status are briefly outlined. The use of compartmental models to simulate the kinetics of compounds in the environment is illustrated by a discussion of carbon dioxide in the atmosphere and oceans and its uptake by plants. The application of compartmental models to the kinetics of organochlorine compounds in vertebrates and in ecosystems is then reviewed. Available evidence suggests that the kinetics of organochlorine insecticides such as *p,p'*-DDT and dieldrin in vertebrates may be consistent with the following propositions: the concentration of an organochlorine insecticide in a particular tissue is a function of the daily intake; the concentrations of the insecticide in different tissues are functionally related; the concentration of the compound in a particular tissue is dependent on the duration of its ingestion; and when the ingestion of the compound is terminated, the concentrations in the tissues decline and the rates of decrease at a given time are proportional to the concentrations in the tissues at that time. These empirical propositions are consistent with a compartmental model of the mamillary type in which the circulating blood constitutes the central compartment and there is at least one peripheral compartment, the adipose tissue. Assuming the compartmental models are valid simulations of ecosystems, it appears that there may be significant mechanisms of removal of organochlorine insecticides from the biosphere, possibly by chemical degradation in the troposphere or stratosphere; these mechanisms require detailed investigation to assess their importance.

76-1758. Gottschewski, G. H. M. (Max-Planck-Inst. Immunobiol., Freiburg, Germany). **Neue Moeglichketen zur grosseren effizienz der toxikologischen Pruefung von Pestiziden, Rueckstaeden und Herbiziden. [New possibilities for increased efficiency in toxicologic testing of pesticides, residues, and herbicides.]** *Qual. Plant. Plant Foods Hum. Nutr.* 25(1): 21-42; 1975. (19 references) (German)

An experimental model was devised for determining the combined effects of all food and soil additives in experimental animals. Using mammalian species,

parameters measured were: number of coitions necessary per litter, number of corpora lutea, resorbed fetuses, suckling, building a nest, offspring dying within various intervals before and after birth, anomalies, brain anomalies, and the blood status of the mother. Deviations are much more frequently encountered in the embryonic organism than in the fetal and adult system. Because of the large number of food and soil additives, it is difficult to correlate specific symptoms in the growing human being with a specific compound. Food obtained from the market was compared with a diet containing no additives. Although it has been impossible to prove a "no effect" level of food and soil additives with conventional experimental models, there is no data to affirm the safety of present food management practices.

76-1759. Vasyukova, E. A.; Granovskaya, A. M.; Ryzhikov, V. D.; Ametov, A. S. (Author address not given). **Lechenie bolezni Itsenko-Kushinga khloditanom.** [**Treatment of Itsenko-Cushing's disease with chlodithane.**] *Ter. Arkh.* 47(12): 113-117; 1975. (17 references)

The effects were studied of *o,p'*-DDD (chlodithane, TDE) on the function of the adrenal cortex in Itsenko-Cushing's disease. The results of the study indicate that the use of chlodithane in this disease caused considerable improvement in the clinical condition of the patients. The drug decreased the glucocorticoid, androgenic, and mineralocorticoid function of the adrenal cortex and increased the adrenocorticotropic hormone level in the blood plasma. It is suggested that combined treatment with chlodithane and radiotherapy of the hypothalamic-hypophysial region may be useful in the treatment of Itsenko-Cushing's disease.

76-1760. Schmid, M. (Medizinische Klinik, Stadtspital Waid, Zurich, Switzerland). **Umwelteinfluesse auf Leber und Magen-Darm-Trakt.** [**Environmental influences on liver and gastrointestinal tract.**] *Schweiz. Med. Wochenschr.* 106(9): 289-295; 1976. (32 references) (German)

Data on the metabolism of exogenous substances in the liver and on hepatic enzyme induction by exogenous substances and its toxicological implications is reviewed. The liver plays a major role in the detoxication and elimination of liposoluble toxic substances, transforming them into polar water-soluble metabolites on the membranes of the smooth endoplasmatic reticulum. The oxidation, the first step of this metabolism, is due to the action of cytochrome P-450 together with methyltetrahydrofolate and NADPH. The hydroxylated metabolites are further conjugated with glucuronic acid or other organic anions, such as amino acids, by transferases. This metabolic pathway implies a detoxication in most cases. Many substances, including drugs and pesticides, such as DDT, and especially polychlorinated biphenyls, induce hepatic enzymes. While no serious acute liver damage due to DDT has ever been observed, the hazard of DDT lies in its potent enzyme-inducing capacity during its prolonged storage in the organism. The DDT-induced disturbances in the calcium metabolism are due to the accelerated elimination of vitamin D by the induced smooth endoplasmic reticulum.

76-1761. Berg, J. W. (Dep. Preventive Med., Univ. Iowa, Iowa City, IA 52242). **Nutrition and cancer.** *Semin. Oncol.* 3(1): 17-23; 1976. (11 references)

Recent evidence regarding the carcinogenic potential of various dietary chemicals is reviewed. Pesticides such as DDT and related compounds can produce tumors in animals, but it is not known whether DDT is a human carcinogen. Aldrin and dieldrin are somewhat newer compounds whose presence in food has also been considered a risk on the basis of animal experiments; they produce liver cancers in mice, but their effect on other species is debatable. All of these compounds have been banned, although they may be replaced on farms by arsenic, a proven human carcinogen, and heptachlor, an even more potent carcinogen in mice. The potentially carcinogenic effects of polycyclic aromatic hydrocarbons, nitrosamines, aflatoxins, asbestos, diethylstilbestrol, food additives, and heavy metals are also discussed, as are dietary associations with particular cancers.

76-1762. Baxter, R. A.; Gilbert, P. E.; Lidgett, R. A.; Mainprize, J. H.; Vodden, H. A. (Nickell Labs., Monsanto Chem. Ltd., Wrexham, Denbighshire, England). **The degradation of polychlorinated biphenyls by microorganisms.** *Sci. Total Environ.* 4(1): 53-63; 1975. (10 references)

The effects were studied of two microorganism cultures on single compounds and multicomponent mixtures of polychlorinated biphenyls. Prepared substrates comprised of PCBs, inocula, mineral solutions, inhibitors, etc. were shaken for various periods of time and the loss of PCB was then determined by gas chromatographic analysis of extracts. The results of the single compound and simple mixture studies show that many PCBs can be degraded by microorganisms. Many of the lower chlorinated biphenyls (3 or less chlorine atoms/molecule) were readily degraded. Even certain compounds containing as many as 6 chlorine atoms could be degraded under favorable circumstances. The pattern of chlorination may influence the ease of biodegradation. The studies conducted on complex mixtures revealed a different pattern. Some lower chlorinated compounds which had appeared to be slowly degraded when alone degraded quite readily when present in the mixture. Mutual solubilization may be an important factor in this effect. The pattern of degradation can be explained in terms of adaptation of the organisms. Mono- and dichlorobiphenyls can be degraded with little or no further adaptation of the biphenyl degrading organisms. For highly chlorinated components the adaptation may be necessary. The observed enhanced biodegradation of certain PCBs by addition of biphenyl to the substrate may indicate a co-metabolic mechanism.

76-1763. Syrowatka, T.; Palut, D.; Bankowska, J. (Dep. Toxicol. Sanit., Natl. Dep. Hyg., Warsaw, Poland). **Wiazanie sie karbarylu 1-naftylo-*N*- méthylo-karbaminianu z RNA i bialkami watroby szczura. [Binding of carbaryl (1-naphthyl-*N*- methyl-carbamate) by RNA and rat liver proteins.]** *Rocz. Panstw. Zakl. Hig.* 26(6): 683-690; 1975. (11 references)

A study was made of the binding of ^{14}C-labeled carbaryl by cellular elements of rat liver. Carbaryl was labeled in the carbonyl group and aromatic ring. The percent of ether-soluble carbaryl metabolites as well as that of water-soluble metabolites and $^{14}CO_2$ released during hydrolysis of the preparation labeled in the carbonyl group were determined. After incubation, the sediment formed contained microsomal proteins and RNA. It was separated into fractions and recovery of the protein fraction was achieved by lipid extraction with solvents. The results of the study indicated that stable binding of ^{14}C with microsomal proteins from the liver occurred. The amount of binding by proteins of the compound labeled in the carbonyl group differed from that of the compound labeled in the ring, suggesting at least two quite different mechanisms of binding occur.

76-1764. Riedel, O. (Toxicol. Dep., Sch. Pharm., Natl. Univ. Ceara, Fortaleza, Brazil). **Acao dos organofosforados na acetilcolinesterase. [Action of organophosphates on acetylcholinesterase.]** *Rev. Bras. Clin. Ter.* 2(10): 515-520; 1973. (7 references) (Portuguese)

The chemical processes by which acetylcholinesterase dismantles the acetylcholine molecule and then regenerates itself, by which the organophosphates inhibit this regeneration, and by which the oximes promote regeneration in the presence of organophosphates are now better understood, making it possible to develop more effective and less harmful pesticides, to treat organophosphate poisoning more effectively, and to control occupational illness caused by chronic poisoning. The chemical mechanisms of the above processes are explained in detail with the use of helpful diagrams.

76-1765. Pena Yanez, A.; Juarez Fernandez, C.; Mariscal Mejias, M.; Toro Rojas, F.; Torres Velasco, F.; Cortina de Luna, J. L. (Dep. Int. Med., Sch. Pathol. Med. Clin. II, Univ. of Granada, Granada, Spain.) **Carcinoma corticosuprarrenal no funcionante y pielonefritis cronica focal. [Nonfunctioning adrenal cortical carcinoma and chronic focal pyelonephritis.]** *Rev. Clin. Esp.* 137(6): 565-570; 1975. (42 references) (Spanish)

The case history is presented of a 23 yr old woman with adrenal cortical carcinoma without pathological endocrine syndrome, and with concurrent chronic focal pyelonephritis. She was subjected to surgery (removal of the tumor and nephrectomy) and released 23 days later in markedly improved condition. A brief review on the therapeutic use of *o,p'*-DDD in diseases of the adrenal gland follows the presentation of the clinical case. It is stated that up to the year 1959 there was no drug therapy for adrenal carcinomas. During 1959 and 1960 the beneficial effects of *o,p'*-DDD in the treatment of metastatic carcinomas of the adrenal glands were published. In a patient with Cushing's syndrome, *o,p'*-DDD produced adrenolytic effects at the level of the fascicular and reticular zones, while the integrity of the glomerular zone was conserved; it induced the inhibition of cortisol secretion without the presence of concurrent adrenal insufficiency. When administered in low doses (less than 3 g/d), the tolerance is good. In conclusion, *o,p'*-DDD is considered the therapy of choice for Cushing's syndrome and increases the survival time in cases of malignant tumors of the adrenal glands.

76-1766. De Moor, H.; Huyghebaert, A. (Lab. Chim. Pro. Aliment., Fac. Sci. Agron., Univ. de l'Etat de Gand, Ghent, Belgium). **Elimination des residus de pesticides de l'organisme animal. [Elimination of pesticide residues in animals.]** *Rev. Agric.* 27(4): 837-848; 1974. (45 references) (French)

To remove pesticide residues from animals three methods can be used: reduction of the fatty layer and, simultaneously, stimulation of metabolic activity; modification of the absorption of the pesticides in the intestine; and increase of metabolic degradation. DDT has been eliminated from cattle tissue by irregular feeding or by alternating feeding with periods of fasting. This dietary program can be supplemented with thyroprotein. In general, however, the speed of elimination is insufficient, although the contamination of products obtained from animals thus treated more rapidly drops below the tolerance limits than do control products. Weight loss and other physiological factors also jeopardize the validity of this approach. The use of barbiturates as metabolic enhancers is promising although the rapidity of elimination depends on a number of factors. Although phenobarbital has been shown to work well with dieldrin, it is not very effective with DDT. It is possible that phenobarbital as well as other barbiturates will accelerate the elimination of other organochlorine compounds, but little research has yet been done. The effects of activated charcoal will depend on whether it is ingested simultaneously with the pesticide or after contamination. The elimination of dieldrin from cows is accelerated when the activated charcoal is administered at the same time as the contaminated product; when both products are present in the digestive tract, the activated carbon acts as an adsorbent, but it is not active if administered following contamination with DDT, DDD, or dieldrin. The animal species is also an influential factor. Activated charcoal is not effective for hens. The combined use of phenobarbital and activated charcoal accelerates elimination, since the phenobarbital increases pesticide circulation and the activated charcoal, administered at the same time as the phenobarbital, will be effective even if the products are administered after contamination.

76-1767. Bus, J. S.; Aust, S. D.; Gibson, J. E. (Dep. Pharmacol., Michigan State Univ., East Lansing, MI 48824). **Lipid peroxidation: a possible mechanism for paraquat toxicity.** *Res. Commun. Chem. Pathol. Pharmacol.* 11(1): 31-38; 1975. (21 references)

Adult female Swiss-Webster mice were maintained on diets containing 0.40 ppm selenium (controls) or 0.01 ppm selenium (selenium deficient), or were given diets deficient in vitamin E. Other animals were treated with diethyl maleate (1.2 mg/kg, i.p.). The 7-day i.p. LD50s for paraquat were determined in these mice. The paraquat LD50 was significantly reduced in the mice treated with diethyl maleate or fed the selenium or vitamin E deficient diets as compared with the controls. Selenium and vitamin E deficiency were confirmed by liver function tests and the sialuric acid red blood cell hemolysis test. When the respective basal deficient diets were supplemented with selenium (0.1 or 2.0 ppm) or vitamin E (45 or 1500 mg/kg), the paraquat LD50 was similar to control values. However, high levels of selenium (2 ppm) or vitamin E (1500 mg/kg) did not offer any added protective effect against paraquat toxicity. The data suggests that lipid peroxidation is an important in vivo biochemical mechanism of paraquat toxicity.

76-1768. Ferrando, R.; N'Diaye, L.; Gautier, F.; Henry, N. (Lab. Nutr. Aliment., Ecole Nat. Vet., 94701 Alfort, France). **Effets, chez la caneton, de regimes renfermant du tourteau d'archide contenant des aflatoxines en association ou non avec du DDT ou du phenobarbital. Comparison avec un regime a base de soja.** [**Effects on ducklings of peanut diets containing aflatoxins with or without DDT or phenobarbital. Comparative study with a diet based on soybean.**] *Rec. Med. Vet. Ecole Alfort* 150(7): 601-606; 1974. (10 references) (French)

Ducklings (*Anas carina moscata*) were fed peanut cake contaminated with 0.250 ppm of aflatoxin B_1, and containing different concentrations of DDT or phenobarbital. A control group received aflatoxin-contaminated peanut cake without DDT or phenobarbital. DDT, added to the diet in 150 ppm concentration, and phenobarbital, added at a rate of 100-200 ppm, reduced the toxicity of aflatoxin B_1, which manifested itself, at the end of the 3-week test, in a reduced mortality rate, increased growth, and improved feed efficiency, as compared with the control group given aflatoxin alone. When added at a rate of 50 ppm, DDT had no effect on the toxicity of aflatoxin B_1.

76-1769. Znamenskiy, V. V.; Zherebchenko, P. G.; Terekhov, A. V. (Author address not given). **Osobennosti radiozashchitnogo deystviya i toksichnosti tsistafosa pri vnutrivennom sposobe vvedeniya.** [**Radioprotective action and toxicity of cystaphos administered intravenously.**] *Radiobiologiya* 14(4): 604-607; 1974. (10 references) (Russian)

The radioprotective action and toxicity of cystaphos was studied, after administration to mice in a dose of 2 m*M*/kg intravenously. The radioprotective action was the same as after intraperitoneal administration when radiation followed 30 min later, but it started to decline earlier after intravenous administration than after intraperitonal introduction when the interval between administration and irradiation was increased to 60 min. Unlike cysteamine, cystaphos was less toxic after intravenous than after intraperitoneal or subcutaneous administration, which may be due to the differences in their action on vascular receptors.

76-1770. Sram, R. J. (Inst. Hyg. Epidemiol., Cent. Gen. Environ. Hyg., Prague, Czechoslovakia). **Genetic risk from chemicals: mutagenicity studies and evaluation.** *Rev. Czech. Med.* 21(4): 186-193; 1975. (37 references)

A Czechoslovak research program concerned with the mutagenic effects of chemical substances made use of mutagenicity testing in *Drosophila melanogaster* and mice, testing of repair mechanisms of genetic damage, determination of interspecies differences, and determination of the genetic risk from chemical substances used in practice. Studies of this type have revealed the ability of puromycin and rifampicin to reduce the frequency of TEPA-induced translocations in *Drosophila*. Using the genetic test to assess partial hereditary sterility, the transfer of TEPA-induced translocations to the F_1 generation was demonstrated in the spermatids and spermatogonia of mice. The simultaneous administration of TEPA and chloramphenicol to mice elevated the frequency of dominant lethals in the stage of late spermatids, whereas the simultaneous administration of TEPA and puromycin in the postmeiotic stage of spermatogenesis reduced the frequency of dominant lethals to control levels. Cytogenetic analysis of meiotic chromosomes was a less suitable method for studying the combined effect. Fenitrothion, when administered chronically per os to four generations, did not increase the frequency of dominant lethals and chromosomal aberrations in the bone marrow. Similarly, a single or repeated administration of ETU did not influence the frequency of dominant lethals, although the frequency of chromosomal aberrations in the bone marrow was increased in a dose-dependent fashion.

76-1771. Solomakha, A. I. (Sci. Res. Inst. of Agriculture in Arctic Regions, USSR). **Morfologicheskie i biokhimicheskie izmeneniya v krovi severnykh oleney pri vnutrimyschechnom vvedenii famofosa.** [**Morphological and biochemical changes in the blood of reindeer after intramuscular injection of famophos.**] *Sib. Vestn. S-kh. Nauki* 4(3): 84-89; 1974. (6 references) (Russian)

Morphological and biochemical changes in the blood of reindeer were studied at different times following the intramuscular injection of a single dose of famophos (famphur, 20 or 40 mg/kg). Increased hemoglobin level, erythrocytosis, increased hematocrit value, neutrophilic leukocytosis, eosinopenia, and lymphopenia were observed. The biochemical changes included acetylcholines-

terase inhibition, hyperglycemia, increased gamma-globulin level, reduced ascorbic acid concentration, and reduction of the inorganic phosphorus and calcium levels. The morphological and biochemical changes were reversible. The time necessary for the normalization of the above parameters was a function of the dose administered.

76-1772. Ito, T.; Miyake, Y. (Sch. Biochem., Fac. Pharm., Kinki Univ., Higashiosaka, Osaka, Japan). [**Effects of minute amounts of agricultural chemicals on enzymes in living organisms.**] *Kinki Daigaku Kogai Kenkyusho Kenkyu Hokoku (Rep. Res. Inst. Environ. Pollut.)* 3: 8-10; 1975. (13 references) (Japanese)

Carbaryl and propham were administered p.o. after dissolving in olive oil to male dd-strain mice at the rate of 1 mg/kg/day for 12 weeks. Specified numbers of the mice were killed each week for determination of GOT and GPT activities in plasma and liver and ChE activities in liver, plasma, and brain. The GOT activity in plasma and liver decreased after administration of carbaryl; however, the GPT activity was not generally affected as greatly. Liver cholinesterase activity showed no change, but the cholinesterase activity in plasma and brain decreased. These findings suggest that the action of carbamates is more similar to that of organophosphates than to that of organochlorine pesticides.

76-1773. Ichim, A.; Dinu, I.; Radovici, E.; Cristea, E.; Boghianu, L.; Mihailescu, I. (Inst. Hyg. Publ. Sanit., Bucharest, Romania). **Efectul administrarii de dimetoxi-trichlor- hidroxi-etil fosfonat (neguvon) si *N*-metil-1-naftil carbamat (carbaril) asupra unor reactii enzimatice, la sobolanul alb.** [**Effect of dimethoxy- trichlorohydroxyethyl phosphonate (neguvon) and *N*-methyl- 1-naphthyl carbamate (carbaryl) on some enzymatic reactions in rat tissues.**] *Stud. Cercet. Biochim.* 18(2): 103-107; 1975. (11 references) (Romanian)

The effects of neguvon (trichlorfon) and carbaryl were studied on the growth and enzyme activity of young white rats. The rats were exposed to 10 ppm neguvon and 100 ppm carbaryl during a 72 day period. Neguvon inhibited the activity of blood cholinesterase and catalase and increased the activity of serum lactate dehydrogenase, arylsulfatase, and liver glutathione reductase. Carbaryl inhibited the liver phosphomonoesterase activity as well as the blood cholinesterase and catalase activities, and increased the activity of the liver glutathione reductase and of serum lactate dehydrogenase. These changes in enzyme activities demonstrate the occurrence of some biochemical lesions; however, there were no clinical signs of intoxication.

76-1774. Denys, A.; Guilbert-Ber, E.; Levy, J. (Inst. Pharmacol., Fac. Med., Paris, France). **Influence de l'electrochoc chez le rat induit par le chlordane.** [**Influence of electroshock on the rat induced by chlordane.**] *Therapie* 30(4): 591-596; 1975. (6 references) (French)

In rats, as in mice, given long-term treatments with chlordane, electroshock is capable of mobilizing the chlordane stored in the adipose tissue and increasing the degree of the previously acquired enzyme induction; this phenomenon can be suppressed by ethionine. Following enzyme induction by chlordane, the rats were subjected to electroshock on the 8th day of the experiment (5 days after the last injection of the inducer). The effector, pentobarbital, was administered 2 days later to determine the duration of the effects of the electroshock, on the sixth, twenty-fifth, and twenty-seventh days of the experiment. Results indicate that electroshock does not interfere with the effects of pentobarbital in the controls. Applied 48 hours before pentobarbital, it produces a decrease in the length of sleep, significantly greater than that recorded in induced rats not subjected to electroshock; *P* (ratio of average sleep duration obtained experimentally in induced and control rats) was 19, 23, and 29 instead of 61, 57, and 53. Eight days after electroshock, the shortening of sleep was still significant: 9 and 54 minutes instead of 63 and 74. Regardless of whether the rats were subjected to electroshock, the induction ended in 27 days. Ethionine (inhibitor of protein synthesis), administered before electroshock, counters the effects of the latter on induction. Ethionine does not affect the length of sleep produced by pentobarbital in controls: 60 + 5.2 vs. 52 + 2.7 min. Ethionine significantly increases the length of sleep in induced rats subjected to electroshock 48 hours before pentobarbital (*P* = 52 instead of 29). The degree of induction obtained under the influence of ethionine is equal to that of induced rats which did not receive electroshock (*P* = 53). To find pentobarbital doses capable of producing an average induction with a *P* of around 50, a series of rats, for 2 consecutive days, received daily doses ofs75, 50, 37.5, and 25 mg/kg. To determine the effects of electroshock given on the 5th day of the experiment, a 2.5 mg/kg was administered 48 hr after electroshock, on the 7th day of the experiment. Results indicate that electroshock does not modify the effects of pentobarbital in rats induced by pentobarbital and does not produce increased induction.

76-1775. Mendoza, C. E. (Food Res. Div., Bur. Chem. Saf., Health Protect. Branch, Dep. Natl. Health and Welfare, Ottawa, Ontario, Canada). **Toxicity and effects of malathion on esterases of suckling albino rats.** *Toxicol. Appl. Pharmacol.* 35(2): 229-238; 1976. (11 references)

Malathion toxicity in suckling Wistar rats and its effects on cholinesterases and carboxylesterases were studied. The 1-day-old pups were found to be nine times more susceptible to malathion than the 17-day-old pups. Based on the hydrolysis of indophenyl acetate, esterases were markedly inhibited by malathion from 0.5 to 24 hr after dosing. Brain cholinesterases were also inhibited within 0.5 hr but showed a sign of recovery 3 hr after malathion dosing. The development of cholinesterases and carboxylesterases in different organs was followed in rats 1—84 days old. (Author abstract by permission)

76-1776. Courtney, K. D.; Copeland, M. F.; Robbins, A. (Pesticides and Toxic Substances Effects Lab., Environ. Protect. Agency, Research Triangle Park, NC 27711). **The effects of pentachloronitrobenzene, hexachlorobenzene, and related compounds on fetal development.** *Toxicol. Appl. Pharmacol.* 35(2): 239-256; 1976. (19 references)

Pentachloronitrobenzene (PCNB) containing a number of contaminants produced renal agenesis and cleft palate in C57B1/6 mice, cleft palate in CD-1 mice, but was not teratogenic in CD rats. The major contaminant was hexachlorobenzene (HCB), which produced cleft palates and some kidney malformations in CD-1 mice. Purified PCNB (< 20 ppm HCB) showed more maternal toxicity than the contaminated PCNB and resulted in a few cleft palates in the fetuses; there were no kidney malformations with purified PCNB. Thus, the teratogenic activity of contaminated PCNB was probably due to the HCB. Tetrachloronitrobenzene, a contaminant, and pentachloroaniline, a metabolite of PCNB, were not teratogenic in mice or rats. Pentachlorophenol was not teratogenic in rats. Tissue distribution of PCNB, its metabolites pentachloroaniline and methyl pentachlorophenyl sulfide, and the contaminants pentachlorobenzene and HCB were studied in pregnant C57B1/6 mice. The tissue distribution of HCB and pentachlorobenzene was studied in pregnant CD-1 mice. Neither PCNB nor pentachlorobenzene accumulated in tissues. This was in contrast to HCB which accumulated in various tissues such as fat, urinary bladder, skin, and thymus. (Author abstract by permission)

76-1777. Abou-Donia, M. B.; Preissig, S. H. (Dep. Physiol. Pharmacol., Duke Univ. Med. Cent., Durham, NC 27710). **Delayed neurotoxicity of leptophos: toxic effects on the nervous system of hens.** *Toxicol. Appl. Pharmacol.* 35(2): 269-282; 1976. (37 references)

Delayed neurotoxicity in hens fed a single oral dose of leptophos, *O*-(4-bromo-2,5- dichlorophenyl) *O*-methyl phenylphosphonothioate, has been studied. Three doses of the insecticide were given: 200, 400, and 800 mg/kg. Leptophos produced neurotoxicity in hens similar to that reported for other neurotoxic organophosphorus compounds. Thus leptophos caused ataxia which progressed to paralysis and death, caused loss of appetite and weight, and reduced the number and weight of eggs laid. Acetylcholinesterase in red blood cells showed an initial inhibition, then a substantial recovery. On the other hand, plasma cholinesterase, after initial inhibition and recovery, was severely inhibited as the signs of neurotoxicity progressed. Histological examination revealed marked axon and myelin degeneration of the sciatic nerve and spinal cord. Less severe changes were seen in the medulla, and nonspecific degeneration of muscle fibers was present. (Author abstract by permission)

76-1778. Koschier, F. J.; Berndt, W. O. (Dep. Pharmacol. Toxicol., Univ. Mississippi Med. Cent., Jackson, MS 39216). **In vitro uptake of organic ions by renal cortical tissue of rats treated acutely with 2,4,5-trichlorophenoxyacetic acid.** *Toxicol. Appl. Pharmacol.* 35(2): 355-364; 1976. (15 references)

The effect of 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) on renal cortical function has been studied in male adult rats. Significant decreases in organic acid and organic base transport were measured when rats were pretreated with 2,4,5-T 24 hr before in vitro analysis of renal function. Experiments in which injections of *p*-aminohippurate were given showed no effect on organic acid or organic base transport by renal cortical slices. The data are interpreted to mean that pretreatment with 2,4,5-T has a depressive influence on the transport of some organic ions. Adult animals which were treated daily with 2,4,5-T accumulated a large body store of this herbicide during the first 6 days of administration. However, by 9 days the animals excreted essentially the dose of 2,4,5-T administered, and by 16 days the herbicide accumulated during the first 6 days had been almost totally eliminated. This chronic excretion pattern may explain why only moderate toxicity has been reported for this herbicide. (Author abstract by permission)

76-1779. Burchfiel, J. L.; Duffy, F. H.; Sim, V. M. (Seizure Unit, Neurophysiol. Lab., Children's Hosp. Med. Cent., Harvard Med. Sch., Boston, MA 02115). **Persistent effects of sarin and dieldrin upon the primate electroencephalogram.** *Toxicol. Appl. Pharmacol.* 35(2): 365-379; 1976. (21 references)

Rhesus monkeys were injected with the organophosphate sarin or the chlorinated hydrocarbon dieldrin according to one of two schedules: (1) a single "large dose" (5 μg/kg of sarin or 5 mg/kg of dieldrin iv) which produced overt signs of toxicity, or (2) a series of 10 "small doses" (1 μg/kg of sarin or 1 mg/kg of dieldrin, im, given 1 week apart) which did not produce any major clinical signs. Electroencephalograms (EEG) were recorded from chronically implanted electrodes according to the following schedule: (1) three recording sessions prior to drug administration, (2) one at 24 hr post-drug, and (3) another three at 1 yr post-drug. Each recording session consisted of runs in the following states: (1) awake and alert in a lighted environment, (2) awake and alert in total darkness, and (3) drowsy. A series of control monkeys received equal treatment but were given only drug diluent. Fast-Fourier transforms were performed on the EEGs with a PDP-12 computer to yield voltage vs frequency spectra. Results of statistical analysis of EEG spectra showed the following: For both sarin and dieldrin the single large-dose administration produced significant increases in the relative amount of beta voltage (15—50 Hz) which persisted for 1 yr. For sarin the predominant effect was in the EEG derivation from the temporal cortex, and for dieldrin from the frontal cortex. For both drugs, the beta increase was most prominent in the states of awake in darkness and drowsy. These results indicate that a single symptomatic exposure or a series of subclinical exposures to sarin or

dieldrin can alter the frequency spectrum of the spontaneous EEG for up to 1 yr. (Author abstract by permission)

76-1780. Hoffman, D. G.; Bernhard, N. R.; Worth, H. M.; Emmerson, J. L. (Toxicol. Div., Lilly Res. Lab., Div. Eli Lilly and Co., Greenfield, IN 461405. **Microsomal drug-metabolizing enzyme activity in rats given** α-(2,4-dichlorophenyl)- α-phenyl-5 -pyrimidinemethanol for periods of 14 days to 2 years. *Toxicol. Appl. Pharmacol.* 35(3): 413-421; 1976. (11 references)

The dose-response relationships for stimulation of hepatic drug-metabolizing enzymes were studied in rats given α(2,4-dichlorophenyl)-α-phenyl-5-pyrimidinemethanol (EL-273) in the diet for periods of 2 weeks-2 years. The dietary concentrations ranged from 20 to 5000 ppm. *p*-Nitroanisole metabolism was not affected by EL-273 concentrations of 80 ppm or less. With dietary concentrations of 160—1250 ppm the rate of metabolism increased in proportion to the log of the dose. Concentrations greater than 1250 ppm produced no additional increase. Above a threshold of 80 ppm, EL-273 on the liver at 2 weeks were reversible within 2 weeks on control diet. In chronic tests the increases in relative liver weight and *p*-nitroanisole metabolism reached maxima after 2 weeks of EL-273 administration and remained relatively constant throughout the remainder of the 2-year test. (Author abstract by permission)

76-1781. Mendoza, C. E.; Shields, J. B. (Food Res. Div., Chem. Safety Bur., Food Directorate, Health Protect. Branch, Natl. Health and Welfare, Ottawa, Ontario, Canada). **Effects of hexachlorobenzene on malathion LD50 and on cholinesterase and carboxylesterase activities in organs of the suckling albino rat.** *Toxicol. Appl. Pharmacol.* 35(3): 447-453; 1976. (22 references)

The effects of hexachlorobenzene (HCB) on the LD50 value for malathion and on tissue cholinesterase and carboxylesterase activities were studied in suckling pups of Wistar rats. The dams were fed a diet containing 80 ppm of HCB ad libitum from 2 weeks before mating to the time the litter was sacrificed. HCB obtained by the pups through milk and partially through the placenta increased by more than a factor of two the LD50 value for malathion in 17-18 day old pups. It also increased the content of liver esterases catalyzing the hydrolysis of indophenyl acetate, without any change in the liver cholinesterase activity. Reduction of inhibition of increased resistance to intoxication by malathion or reduction of esterase inhibition was attributed to an increase in tissue carboxylesterase activity, presumably malathionase, and a decrease in malaoxon formation. (Author abstract by permission)

76-1782. Ford, E. J. H.; Araya, O.; Rivera, R.; Evans, J. (Univ. Liverpool, Dep. Vet. Clin. Studies, Leahurst, Neston, Merseyside, England). **The effect of phenobarbital, dieldrin, DDT, and benzene hexachloride on hepatic aminopyridine *N*-demethylase in horses, cattle and sheep.** *Toxicol. Appl. Pharmacol.* 35(3): 475-480; 1976. (20 references)

The daily oral administration of phenobarbital sodium stimulated aminopyrine *N*-demethylase activity in the liver of sheep and horses, and the induced activity fell rapidly when dosing ceased. In sheep, calves, and horses, a single oral dose of dieldrin induced a high level of enzyme activity which persisted for several months. Single oral doses of DDT and benzene hexachloride (BHC) had the same effect in sheep and horses but DDT had no effect in calves and BHC was inconsistent, causing a slight stimulation of enzyme activity in some calves but not in others. This lack of effect may be due to the more rapid metabolism of DDT by cattle. It is also suggested that the exposure of animals to single oral doses of chlorinated hydrocarbons may, by the induction of hepatic drug-metabolizing enzyme activity, alter the animals' susceptibility to other drugs encountered accidentally or administered for therapeutic purposes. (Author abstract by permission)

76-1783. Bus, J. S.; Cagen, S. Z.; Olgaard, M.; Gibson, J. E. (Dep. Environ. Health, Kettering Lab., Univ. Cincinnati, Cincinnati, OH 45267). **A mechanism of paraquat toxicity in mice and rats.** *Toxicol. Appl. Pharmacol.* 35(3): 501-513; 1976. (40 references)

The purpose of this study was to investigate the hypothesis that paraquat toxicity results from cyclic reduction-oxidation of paraquat in vivo, with subsequent generation of superoxide radicals and initiation of lipid peroxidation. Phenobarbital pretreatment (0.1% in drinking water for 10 days) significantly increased the paraquat LD50 in mice, but only when the mice were continued on phenobarbital after paraquat administration. Phenobarbital, through its own metabolism, may be competing for electrons which might otherwise be utilized in paraquat reduction and thus decrease paraquat toxicity. Paraquat, given at 30 mg/kg ip to mice, significantly decreased liver concentrations of the water-soluble antioxidant, reduced glutathione, and lung concentrations of lipid-soluble antioxidants. The decrease in tissue antioxidants may reflect the initiation of lipid peroxidation by paraquat. Oxygen-tolerant rats (exposure to 85% oxygen for 7 days) have increased activities of pulmonary enzymes which combat lipid peroxidation. The paraquat Lt50 (median time to death) after 45 mg/kg of paraquat ip was significantly increased in oxygen-tolerant rats compared to room-air-exposed controls. Rats exposed to 100 ppm paraquat in the drinking water for 3 weeks had significantly elevated activities of lung glucose-6-phosphate dehydrogenase and glutathione reductase. The cross-tolerance of oxygen and paraquat and the induction by paraquat of pulmonary enzymes that supply reducing equivalents to combat oxidative damage support the proposal that paraquat may initiate lipid peroxidation in vivo. (Author abstract by permission)

76-1784. Kociba, R. J.; Keeler, P. A.; Park, C. N.; Gehring, P. J. (Toxicol. Res. Lab., Health and Environ. Res., Dow Chemical U.S.A., Midland, MI 48640). **2,3,7,8-Tetrachlorodibenzo-*p*-dioxin (TCDD): results of a 13-week oral toxicity study in rats.** *Toxicol. Appl. Pharmacol.* 35(3): 553-574; 1976. (50 references)

Rats were given dioxin (TCDD) at dosages of 0, 0.001, 0.01, 0.1, or 1.0 μg/kg, 5 days/wk for 13 wk. Doses of 1.0 μg TCDD/kg/day caused some mortality, inactivity, decreased body weights and food consumption, icterus, increased serum bilirubin and alkaline phosphatase, pathomorphologic changes in the liver, lymphoid depletion of the thymus and other lymphoid organs, increased urinary excretion of porphyrins and delta-aminolevulinic acid, and minimal alterations of some hematopoietic components. Morphological evidence of a functional suppression of the reproductive organs was consistent with either a direct toxic effect of this dose of TCDD, or an indirect toxic effect associated with the poor physical condition of these rats. Doses of 0.1 μg TCDD/kg/day caused decreased body weights and food consumption, and slight degrees of liver degeneration and lymphoid depletion. Other effects seen only in females given this dose level included increases in urinary excretion of coproporphyrin and delta-aminolevulinic acid and increases in serum alkaline phosphatase and bilirubin. Effects seen only in males given this dose level included a depression of some hematologic parameters (packed cell volume, red blood cells, and hemoglobin). In rats given 0.01 or 0.001 μg TCDD/kg/day, all parameters were essentially unaffected, except for a slight increase in the mean liver-to-body-weight ratio in rats given 0.01 μg TCDD/kg/day. This slight increase in relative liver weight was not considered of any toxicological significance. This data indicates that no discernible ill effects occurred in rats given 0.01 or 0.001 μg TCDD/kg 5 days/wk for 13 wk. (Author abstract by permission)

76-1785. Ahdaya, S. M.; Shah, P. V.; Guthrie, F. E. (Dep. Entomol., North Carolina State Univ., Raleigh, NC 27607). **Thermoregulation in mice treated with parathion, carbaryl, or DDT.** *Toxicol. Appl. Pharmacol.* 35(3): 575-580; 1976. (13 references)

The rectal temperatures of mice held at 1, 27, and 38°C were determined immediately before and at several intervals following injection (i.p.) with parathion, carbaryl, and DDT. Whereas the rectal temperature was unchanged by DDT, there was a slight decrease in temperature of parathion-treated mice held at 1°C and a decrease in temperature of carbaryl-treated mice at all temperatures tested. A correlation was shown between cholinesterase inhibition and temperature decrease. Loss of thermoregulation in carbaryl-inhibited mice could be reduced by atropine at both low and high ambient temperatures. The LD50 values of mice injected with parathion and carbaryl were significantly less at 1 and 38°C than at 27°C, whereas the LD50 of DDT-injected mice was unaltered by temperature. (Author abstract by permission)

76-1786. Pilinskaya, M. A. (All-Union Sci. Res. Inst. of Hygiene and Toxicology of Pesticides, Polymers and Plastics of the USSR Ministry of Public Health, Kiev, USSR). **Tsitogeneticheskiy effekt gerbitsida 2,4-D na khromosomy cheloveka i zhivotnykh. [Cytogenetic effect of the herbicide 2,4-D on human and animal chromosomes.]** *Tsitol. Genet.* 8(3): 202-206; 1974. (16 references) (Russian)

The cytogenetic effect of 2,4-D was studied on cultured normal human peripheral blood lymphocytes and on bone marrow cells of mice fed 10-300 mg/kg doses of 2,4-D and decapitated 20 hr after poisoning. Human lymphocytes were incubated with 2,4-D in concentrations of 50-0.002 μg/ml. All concentrations but the lowest caused a significant increase in the number of aberrant metaphases in human lymphocytes. Increasing the concentration over 0.2 μg/ml did not cause any further significant increase in the frequency of aberrations, however. The frequency of aberrations appeared to peak at 2 μg/ml concentration. The ratio of chromatid type to chromosomal aberrations was 4:1. Solitary acentric fragments prevailed among chromatid type aberrations. Symmetrical chromatid exchanges were observed with the lowest 2,4-D concentration. Paired acentrical fragments were prevalent among chromosomal aberrations. While the distribution of the breaks was stochastic within chromosome groups, 81.4% of all breaks were localized to the long shoulders, and most lesions were observed in the telomere third of the long and short shoulders. When administered to mice in concentrations of 10-50 mg/kg, 2,4-D caused neither poisoning syxptoms nor increased chromosomal aberration in bone marrow cells. Significantly increased number of aberrant metaphases, increased number of lesions per metaphase, and increased number of aberrations per aberrant metaphase were observed in bone marrow cells from mice treated with 100-300 mg/kg doses. Solitary acentrical fragments were prevalent. The findings indicate the increased susceptibility of human cells to the cytogenetic action of 2,4-D.

76-1787. Lishenko, N. P.; Lishenko, I. D. (Chair of Botany, Zhitomir Pedagogical Institute, Zhitomir, USSR). **Deystviesparov granozana na mitoz. [Effect of granosan vapors on mitosis.]** *Tsitologiya* 16(4): 515-517; 1974. (2 references) (Russian)

The mitotoxic effect of granosan (ethyl mercuric chloride) on vetch seeds was studied. Vetch seeds were exposed to granosan vapors in closed containers with 180 cm^3 volume, which contained 8 or 40 mg of ethylmercuric chloride, for 6 days. The vapors were lethal in both concentrations. High vapor concentrations completely suppressed the mitotic activity. In a few samples which had been exposed to the lower vapor concentration, and in which mitoses were found, polyploidization of cells and abnormal distribution of chromosomes in anaphases were observed.

76-1788. Matvienko, L. N.; Savel'eva, M. N.; Maksimova, E. P. (No affiliation given). **Rol' nekotorykh ekologicheskihk usloviy v khimicheskom mutageneze. [Role of some ecological conditions in chemical mutagenesis.]** *Tr. Prikl. Bot. Genet. Sel.* 48(2): 95-100; 1972. (7 references) (Russian)

The influence was studied of different environmental conditions on the mutagenic action of *N*-nitrosoethylurea and *N*-nitrosomethylurea used in concentrations of 0.0125-0.1% and 0.005-0.025% on pea seeds. The thickness of the seed shell affected the deformation and late death of the plants rather than the germinating ability. A sharp decline was observed in the penetration of the mutagenic solution into the seed with increasing shell thickness. The toxic effect was aggravated by temperature below +10°C, by soil moisture contents below 50% and above 70%, and by air humidity below 60% and over 70%. The susceptibility of the seeds to the mutagens was essentially influenced by the year in which the seeds were produced.

76-1789. Ternovoy, V. I.; Mikhaylenko, V. .; Grechka, G. A.; Lantseva, G. V. (Stavropol Agricultural Inst., Stavropol, USSR). **Nekotorye pokazateli krovi ovets pri intranazal'noy obrabotke 8% rastvorom khlorofosa. [Some blood indices in sheep following intranasal treatment with 8% solution of chlorophos.]** *Tr. Stavrop. S-kh. Inst.* 5(36): 177-180; 1973. (4 references) (Russian)

The effects of trichlorfon on certain blood indices were studied in sheep for 3-48 hr after nasal irrigation with 15 ml of an 8% solution of this pesticide. No changes were observed in the general health of the animals. A slight decrease in the erythrocyte count and a significant reduction of the hemoglobin level were found after treatment. There were no marked changes in the leukocyte count or in the total serum proteins, while the albumin level showed a significant increase after 6 hr, and the globulin level was slightly decreased 6-24 hr after treatment. The rate of inhibition of the cholinesterase activity was 44% after 3 hr and 69% after 6 hr. The cholinesterase activity normalized in 24 hr. The blood sugar level was increased by 26.6% after 6 hr, and 33% after 24 hr. The blood sugar level approached the initial value after 48 hr.

76-1790. Grechka, G. A. (Stavropol Agricultural Institute, Stavropol, USSR). Funktsional'naya aktivnost' kory nadpochechnikov telyat, obrabotannykh suspenziyami korala i sevina. **[Functional activity of the adrenal cortex in calves treated with Co-Ral and sevin suspensions.]** *Tr. Stavrop. S-kh. Inst.* (36): 181-184; 1973. (2 references) (Russian)

The effect of Co-Ral (coumaphos) and carbaryl, applied by the pour-on method in the respective concentrations of 0.5 and 1% at an expenditure of 3 l/animal, was studied on the functional activity of the adrenal cortex in bullocks through the determination of the blood 11-hydroxycorticosteroid level and by the ACTH stress test. An increase, lasting for 3-4 hr, was observed in the blood corticosteroid level 3 hr after pour-on. The 11-hydroxycorticosteroid levels progressively increased from one application to the next. The maximal level was reached after the tenth application of carbaryl, and after the twentieth application of coumaphos. During the first half of the experiment with carbaryl, the 11-hydroxycorticosteroid level normalized in 1-2 days after each application, and in an even shorter time during the second half of the experiment. The 11-hydroxycorticosteroid levels were permanently elevated in the experiments with coumaphos. The ACTH tests performed at different times during the experiment showed a progressive increase and a final depression of the functional activity of the adrenal cortex, especially in carbaryl-treated animals.

76-1791. Grechka, G. A. (Stavropol Agricultural Institute, Stavropol, USSR). **Issledovanie vliyaniya korala i sevina na uroven' kholesterina v krovi krupnogo rogatogo skota. [Effect of Co-Ral and sevin on the cholesterol level in blood of cattle.]** *Tr. Stavrop. S-kh. Inst.* 5(36): 185-188; 1973. (5 references) (Russian)

The effect of Co-Ral (coumaphos) and carbaryl was studied on the cholesterols and cholesterol esters of the blood of calves. The animals were treated with 0.5% aqueous suspension of coumaphos and with 1% suspension of carbaryl 20 times at weekly intervals, and the analyses were performed 6-168 hr after pour-on. Both pesticides caused hypercholesterolemia. In animals treated with coumaphos, the blood cholesterol level dropped after the tenth application, and was below the control level after the twentieth. The highest cholesterol levels were measured 3-24 hr after application. The levels of cholesterol esters showed a similar variation, and were highest 3-6 hr after the tenth through fifteenth applications. In carbaryl-treated animals, the cholesterol levels began decreasing after the fifteenth application, and the cholesterol esters showed a slower decline than in coumaphos-treated calves. The findings indicate the hepatotoxic effect of carbaryl and especially of coumaphos. The detoxifying activity of the liver started declining after 10-15 applications.

76-1792. Kentikyan, M. A. (Erevan Zoovet. Inst., Erevan, USSR). **Soderzhanie askorbinovoy kisloty v myshtsakh i nekotorykh organakh ovets, otravlennykh khlorofosom. [Ascorbic acid content in muscles and other organs of sheep treated with chlorophos.]** *Tr. Stavrop. S-kh. Inst.* 5(36): 192-194; 1973. (Russian)

Changes in the ascorbic acid levels in muscles, liver, kidneys, and adrenal glands of sheep were studied following single or repeated oral administration of trichlorfon. Regardless of mode of administration, trichlorfon caused a depletion of the ascorbic acid levels, but its changes were dependent of the doses and the staging of the administration. After administration of a single 50 mg/kg dose, the reductions in the liver, muscles, adrenals, and kidneys were 23.2%, 12.9%, 12.9%, and 7.6%. Following

treatment with single 100 and 300 mg/kg doses, the reduction of the ascorbic level averaged 21.4% after 6 days, 23.5% after 9 days, and 50.1% after 21 days. Animals treated with daily 25 mg/kg doses showed a reduction by 48.1% in the liver, by 37.1% in the kidneys, by 35% in the muscles, and by 14.4% in the adrenals after 31 days. A 10-day poisoning with daily 50 mg/kg doses caused a reduction by 30.2% in the liver, by 25% in the muscles, by 19.8% in the kidneys, and by 16.3% in the adrenals. The findings indicate disturbances in the redox processes in the organism due to trichlorfon.

76-1793. Kentikyan, M. L.; Ayrumyan, V. A. (Erevan Zoovet. Inst., Erevan, USSR). **Izuchenie toksicheskikh svoystv myasa ovets, otravlennykh khlorofosom. [Toxic properties of meat from sheep treated with chlorophos.]** *Tr. Stavrop. S-kh. Inst.* 5(36): 195-198; 1973. (Russian)

Meat with different trichorfon residue contents from sheep poisoned with single 50 mg/kg doses was fed to young roosters and cats. Roosters, fed raw meat with 5.5-6.5 mg/kg trichlorfon, ingested a total of 6 mg trichlorfon in 10 days. They ingested 50 g of meat daily. A reduction of the whole-blood cholinesterase level by 22.4-47.2% and reduced weight gain were observed after 6 days, without any other changes being apparent. Depression, loss of appetite, weakness, anemia of the mucous membranes, diarrhea, weight loss, areflexia, and cholinesterase inhibition by 34.2-65.7% were observed after 9 days. No trichlorfon was found in the meat of the slaughtered roosters, and it was fit for human consumption. Cats, ingesting mutton with 1 mg of trichlorfon per kg, took up a total of 1.4-1.8 mg of this substance in 10 days. Depression, weakness, loss of appetite, emesis, and excitation, indicating moderate subacute poisoning, were observed after the 10-day feeding test. The findings indicate the high susceptibility of cats of trichlorfon as compared with roosters. Meat with 5.5-6.5 mg of trichlorfon per kg can be safely fed to roosters for not more than 5 days.

76-1794. Nasilova, V. V.; Ayrumyan, V. A. (Erevan Zoovet. Inst., Erevan, USSR). **Vliyanie khlorofosa na izmenenie obshchego belka i ego fraktsiy v syvorotke krovi bychkov pri naruzhnoy obrabotke. [Effect of external treatment by chlorophos on the change in total protein and its fractions in the blood serum of young bulls.]** *Tr. Stavrop. S-kh. Inst.* 5(36): 199-200; 1973. (2 references) (Russian)

Nine healthy young bulls were treated with 150 ml of an 8% trichlorfon solution by the pour-on method to study its effect on the total serum proteins and their fractions within 6 days after treatment. Increase in the total protein level due to increased albumin concentration without any marked change in the globulin fractions was observed one day after treatment. Both albumins and globulins showed quantitative changes after three days, which were basically due to the α- and γ-fractions. The total protein and its fractions nearly normalized after 6 days. The findings indicate slight changes in the total protein and its fractions in the serum of young bulls which otherwise showed no clinical symptoms of poisoning.

76-1795. Ayrumyan, V. A.; Babina, E. Ya. (Erevan Zoovet. Inst., Erevan, USSR). **Soderzhanie glikogena i molochnoy kisloty v myase bychkov v zavisimosti ot sposobov obrakotki zhivotnykh khlorofosom. [Contents of glycogen and lactic acid in meat fvom young bull in relation to treatment of animals with chlorophos.]** *Tr. Stavrop. S-kh. Inst.* 5(36): 201-205; 1973. (8 references) (Russian)

The glycogen and lactic acid contents of the coxofemoral muscles of 1.5-yr-old bulls were analyzed at different intervals after a single percutaneous treatment of the animals with a 11.6% solution of chlorophos (trichlorfon) in an oil-alcohol mixture, or after oral administration of a single 50 mg/kg dose. A distinct increase was observed in the glycogen content of the meat of animals killed 5-72 hr after percutaneous treatment. The glycogen level was still above normal after storage of the meat for 15 days, at +4°C. While there was no marked difference in lactic acid content between treated and control animals, the lactic acid level was slightly lower in the meat of treated animals than in that of control animals after 15 days' storage. This indicates a certain depression of the enzyme system catalyzing the glycogen metabolism and lactic acid synthesis. The glycogen levels were below normal in animals killed 24 hr after oral trichlorfon administration, but they were above normal when the animals were killed 3-12 days after poisoning. The lactic acid level in the meat was increased 1-3 days after oral treatment, but it was normal later. The glycogen level was lowest and the lactic acid acid level was highest in meat stored at +4°C for 15 days when the animals were killed on day after treatment.

76-1796. Maslennikova, V. I.; Vodyanov, A. A. (Stavropol Agricultural Institute, Stavropol, USSR). **Dinamika soderzhaniya lindana v organakh i tkanyakh ovets posle ikh protivochesotochnoy obrabotki v GGMME. [Dynamics of lindane content in sheep organs and tissues after antiscabies treatment with a mineral oil emulsion of gamma-hexachlorocyclohexane.]** *Tr. Stavrop. S-kh. Inst.* 5(36): 331-334; 1973. (7 references) (Russian)

Samples of muscle, heart, lung, kidney, liver, and epirenal and body fat were taken from sheep at different times after dipping in a 0.03% mineral oil emulsion of lindane for scabies control. The specimens were analyzed for lindane residues by gas chromatography and chromatooscillopolarography. The samples taken from animals killed 15 days after bathing contained 90-1,680 μg of lindane per kg, averaging 504 μg/kg, in samples from animals killed 30 days after treatment. No lindane residues were found in sheep killed 60-135 days after treatment. The residue levels were highest in epirenal and body fat and lowest in muscles, heart, and liver after both 15 and 30 days. Good agreement was found between the gas chromatographic and chromatooscillopolarographic results.

76-1797. Nepoklonov, A. A.; Metelitsa, V. K. (Author address not given). **O metabolizme i srokakh sokhraneniya khlorofosa v organizme krupnogo rogatogo skota.** [**Metabolism and retention of chlorophos in cattle.**] *Tr. Vses. Nauchno-Issled. Inst. Vet. Sanit.* 39: 155-164; 1971. (16 references) (Russian)

The metabolism and persistence were studied of chlorophos (trichlorfon) and its mezabolite, DDVP (dichlorvos), in cattle. The animals were treated with 11.6% oil-alcohol solution of trichlorfon (dose: 24 ml/animal, corresponding to 8-12 mg/kg), or with 8% aqueous solution (dose: 200 ml/animal, corresponding to 53.3-80 mg/kg) by the pour-on method. The trichlorfon concentration in the organs and tissues was highest, at 0.68-1.1 mg/kg, during the first 4 days after treatment. Both DDVP and an unidentified metabolite with *Rf* 0.45 were found in tissues. The DDVP concentration ranged from trace to 1.2 mg/kg, and was highest during the first 4 days. The levels of the trichlorfon and DDVP residues decreased in the order muscles, heart, liver, kidneys, lungs, spleen, testes, and mammary glands. Residues of trichlorfon and DDVP were demonstrated in the tissues of slaughtered animals for up to 15 days for chromatography, and for up to 22 days by an agar diffusion enzyme test. The meat of animals slaughtered within these periods became fit for human consumption after 30 days' storage at a temperature of -5 to -6°C.

76-1798. Jung, K. D. (Hyg. Inst. Ruhrgebietes, Gelsenkirchen, Germany). **Etude bibliographique de la sensibilite des crustaces utilises (Daphnie, Gammare, Artemia) vis a vis des produits chimiques.** [**Bibilographic study of the sensitivity of crustaceans (Daphnia, Gammarus, Artemia) in the presence of chemical products.**] *Trib. CEBEDEAU (Cent. Belge Etude Doc. Eaux)* 28(381-382): 301-303; 1975. (27 references) (French)

In addition to the physicochemical quality of water, the most important criteria affecting toxicity tests are temperature, turbidity (affecting adsorption of the substance being tested before it is ingested by the organisms), the difference betweef static and dynamic test conditions, and, sometimes, differences in sensitivities or resistance in a single species. In general, fish are more sensitive than mammals; however, certain products (thiophosphoric acid esters) are less toxic to fish and seem to be more active in arthropods such as crustaceans. In a comparative test with fish, almost a thousand products were assayed on *Daphnia*, a few hundred on *Gammarus*, and a hundred on *Artemia*. Results indicate that *Daphnia* and *Gammarus* have a sensitivity to various chemical products equal to that of fish. *Artemia nauplii* seem to be the ideal animals for bioassays because of their rapid hatching; however, they seem to be insensitive to certain products. Adult grey shrimp are more sensitive, though they take 5 to 8 weeks to develop.

76-1799. Benijts-Claus, C.; Persoone, G. (Lab. Biol. Onderzoek Milieuverontreiniging, Rijksuniv. Gent, Ghent, Belgium). **La toxicite de trois herbicides sur l'ecosysteme aquatique.** [**Toxicity of three herbicides in the aquatic ecosystem.**] *Trib. CEBEDEAU (Cent. Belge Etude Doc. Eaux)* 28(383): 340-347; 1975. (10 references) (French)

The toxicity was studied of paraquat, diquat, and 2,4-D to microscopic algae, ciliates zooplankton, and fish. Results indicate that the toxicity varies significantly depending on the test organism. Using factorial analysis techniques, a TLM of 0.1-0.4 ppm was found for algae exposed to paraquat and diquat. The addition of detergents, with the exception of 25% detergent in a 1 to 1 to 9 ratio, always increases the toxicity of the commercial product. Zooplankton (*Daphnia*) are much less sensitive to paraquat than the algae; results are basically the same with or without detergents. Un general, diquat is more toxic than paraquat. There is also an interspecific sensitivity difference—*Daphnia pulex* are far more sensitive than *Daphnia magna*. The TLM ranges around 2-4 for paraquat and 3-5 ppm for diquat. Fish are the least sensitive. With 2,4-D no toxic effects to algae are seen at doses lower than 300 ppm. Ciliates are slightly more sensitive, although the lethal dose after 3 days is only 50-100 ppm. The relativity of the results is notable, since various TLMs are obtained for the same organisms kept in different culture media. It is necessary to determine which is the most sensitive trophic link in the aquatic ecosystem. One or more representative of each trophic level from both pelagic and benthic communities should be included in organism tests.

76-1800. Kool, H. J. (Author address not given). **Quelques techniques pour mesurer les effets toxiques des pollutants chimiques dans l'eau.** [**Some techniques for determining toxic effects of chemical pollutants in water.**] *Trib. CEBEDEAU (Cent. Belge Etude Doc. Eaux)* 28(383): 348-358; 1975. (22 references) (French)

The acute toxicity of chemical pollutants in water can be determined with a continuous or semi-continuous monitoring system. The test organisms are observed either for inhibition of oxygen consumption or for variations in the frequency of movement. Such a system will promptly provide information on the presence of toxic products but not on their identity. It should thus be supplemented with physico-chemical monitoring although it can give a more direct indication of toxicity than the latter. ATP has been chosen as a biochemical parameter for measuring biomass and metabolism. The quantity of ATP in the cells will be a measure of the stress on the organisms. To detect mutagenic and carcinogenic compounds, a relatively simple bacterial test, the Ames test, has recently been developed. A layer of bacteria unable to grow because of a mutation are placed in a Petri dish. If the mutagenic agent can induce a reverse mutation in a bacterium, this bacterium will be able to form a colony; subsequently, a circle of colonies will appear around the inoculated area. Mutagenic agents affect DNA in both bacteria and man. If a substance is mutagenic for bacteria, it is likely to be mutagenic for man as well. This system can also be used to study waste waters, surface waters, and tap water.

76-1801. Heath, R. G.; Spann, J. W.; Hill, E. F.; Kreitzer, J. F. (Patuxent Wildl. Res. Cent., Div. Wildl. Res., Bureau Sport Fish. Wildl., Laurel, MD 20810). **Comparative dietary toxicities of pesticides to birds.** *U. S. Fish Wildl. Serv., Spec. Sci. Rep.: Wildl.*, No. 152, 1972. 57 p. (21 references)

Measurements were made of the lethal dietary toxicity of 89 pesticides to young bobwhites, Japanese quail, ring-necked pheasants, and mallards. The pesticides studied included insecticides, herbicides, and fungicides. Probit analysis was used to determine the LC50s and associated statistics. Endrin was consistently the most toxic chemical. Aldrin and dieldrin were among the six most toxic chemicals of those tested on all species. Generally the organophosphates were less toxic than were aldrin or dieldrin. The herbicides tested were of a low order of toxicity. There were obvious inconsistencies in the relative sensitivities of the four species to various chemicals.

76-1802. Malecki, R. A.; Allen, S. H.; Elliston, J. O.; Sadler, K. C.; Goforth, W. R.; Baskett, T. S. (U.S. Bureau Sport Fisheries and Wildlife, Missouri Cooperative Wildlife Res. Unit., Columbia, MO). **Cottontail reproduction related to dieldrin exposure.** *U. S. Fish Wildl. Serv., Spec. Sci. Rep.: Wildl.*, No. 177, 1974, 61 p. (23 references)

The effects of dieldrin were studied on wild-trapped young cottontails (*Sylvilagus floridanus*). The animals were exposed to annual ground applications of dieldrin (0.5 and 2.0 lb/acre, granular). No signs of reproductive abnormality were noted among breeding male rabbits. Testis weights were comparable at all dose levels. Spermatozoa were evident in microscopic examinations of the seminiferous tubules. Among females there were no measurable differences in onset and synchrony of breeding between control and treated rabbits. Conception dates between the two groups were comparable. The treatments did not significantly affect ovulation rates, preimplantation losses, resorption of embryos, or embryonic litter size. Among treated animals the residue levels in brain, liver, and muscle tissue were significantly higher than in controls. It was also noted that accumulation of pesticide was related to amount applied. Lethal accumulations of dieldrin were found in brains of 3 cottontails. No adequate measures of postnatal mortality were obtained. No conclusive evidence of stress was recorded among penned animals, dieldrin treated or not. Dieldrin persisted in the treated soil from one year to the next, following the annual applications. These applications fell within the limits of recommended agricultural rates. The levels of dieldrin residues in cottontail tissues reflected the rate of application and the level of residue in the soils.

76-1803. Selivanova, A. S.; Mukhantsev, V. P. (Dep. Ther., Kazan Vet. Inst., Kazan, USSR). **Primenenie trikhlorofosa pri askaridioze kur.** [**Use of trichlorophos in ascaridosis of chickens.**] *Uch. Zap. Kazan. Vet. Inst.* 112: 209-214; 1972. (5 references) (Russian)

The anthelminthic effectiveness and toxicity of trichlorophos were studied in chickens. When the dose was administered in 0.1% aqueous solution, the optimal dose was found to be 50 mg/kg. The LD50 values for single and repeated doses were 199.3 mg/kg and 884 mg/kg, respectively, compared to 155 mg/kg and 377.5 mg/kg for chlorophos (trichlorfon). The cumulation factor was found to be 5.47, compared to 3.34 for chlorophos. Sharp declines in the blood cholinesterase activity were produced within 2-4 hr by both trichlorophos and chlorophos, with subsequent normalization in 2-4 days. Cholinesterase inhibition was strongest in brain, liver, and intestine; in these organs the enzyme activity normalized in 4-7 days. There was no change in cholinesterase activity in chickens given water containing trichlorophos corresponding to a dose of 15-25 mg/kg for 2 weeks. Doses of 50-150 mg/kg caused transient changes in the blood cell count and serum proteins.

76-1804. Senyushkin, A. F. (Kazan. Vet. Inst. im. Baumana, Kazan, USSR). **Pharmaco-toxicologicheskaya characteristika trichlorofosa.** [**Pharmaco-toxicological characteristics of trichlorophos.**] *Uch. Zap. Kazan. Vet. Inst.* 112; 220-222; 1972. (3 references) (Russian)

A study was made to determine the toxic properties of trichlorophos and its effects on skin and ocular mucous membrane after topical application. The experiment was conducted on white mice, rats, and rabbits. The animals were bathed for 5 minutes in trichlorophos at concentrations of 1, 5, 10, or 25%. Two drops of trichlorophos were placed in one eye of each rabbit. A 3-5% trichlorfon solution in the eyes produced reactions within two hours: lacrimation, hyperemia, and inflammation of the mucous membranes and eyelids. This reaction continued for 3-7 days, after which the eyes returned to normal. The 10% solutions resulted in hyperemia, inflammation of the mucous membranes, and bleeding of the eyelids. This continued for 8-10 days. The animals first became hyperactive, then became slightly depressed. The results indicate that trichlorophos is a moderately toxic preparation and can be used an an acaricide and repellent in place of chlorophos (trichlorfon).

76-1805. Kolov, A. Q.; Chervyakov, D. K. (Dep. Pharmacol., Kazan' Vet. Inst., Kazan', USSR). **Vliyanie trichlormetafosa-3 i trolena na motoriku i fiziko-khimicheskie svoystva khimusa toshchey kishki ovets.** [**Effect of trichloromethaphos-3 and trolene on the dynamics and physicochemical properties of chyme in the small intestine of sheep.**] *Uch. Zap. Kazan. Vet. Inst.* 112: 227-232; 1972. (7 references) (Russian)

Sheep were administered 20-150 mg/kg doses of trichlorometaphos-3 or 40-100 mg/kg doses of trolene (ronnel) in 0.5-1% suspensions in water to study the effects of these preparations on the contractions and on the physicochemical properties of chyme in the jejunum. Trichlorometaphos-3, administered in 20 and 40 mg/kg

doses, and trolene, given in a 40 mg/kg dose, increased the frequency of peristaltic contractions of the jejunum. The stimulating action of the pesticides was most pronounced in the caudal section of the jejunum. The stimulation increment decreased with increasing doses. Trichlorometaphos-3 and trolene doses of 40-1)0 mg/kg caused a shift of the chyme pH into the alkaline range and reduced the consistency and provoked a change in the color of the chyme.

76-1806. Titov, V. V.; Titova, G. S.; Kochkurova, V. N.; Efremov, M..I.; Potapenko, N. N. (Lab. Microbiol., Kazan' Vet. Inst., Kazan', USSR). **Patomorfologicheskie i gistokhimicheskie izmeneniya vnutrennykh organov sviney pri otravlenii granozanom. [Pathomorphological and histochemical changes in internal organs of pigs during granosan poisoning.]** *Uch. Zap. Kazan. Vet. Inst.* 112: 328-334; 1972. (2 references) (Russian)

Pathomorphological and histochemical investigations are presented of pigs that died during a mass poisoning with granosan-contaminated feed at a pig farm. The feed contained 1.2-12.5 mg of mercury per kg. The mercury levels in dead animals were highest in liver (50-150 mg/kg) and kidneys (83.6-150 mg/kg). Edema of the gastric and intestinal mucosa, enlargement and hyperemia of the gastric and mesenteric lymph nodes, hepatomegaly, dilation of the gallbladder with thick, dark green bile, enlargement of the kidneys, stasis and hyperemia of the mucosa of the urinary bladder, dilation of the heart with multiple focal hemorrhages in the epicardium, pronounced pulmonary edema, pronounced stasis of the cerebral blood vessels, and edema of the gray matter and white substance were found on autopsy. Histological examinations revealed granular fatty degeneration of the epithelium of the renal tubules, pronounced dystrophic and necrotic changes of the liver, glycogenic degeneration of the myocardium, and hemodynamic disorders associated with dystrophic and inflammatory changes in the gastric and intestinal mucosa. The histological changes were most pronounced in the organs with the highest mercury contents, i.e., the liver and kidneys. Reduction of the succinate dehydrogenase and acid and alkaline phosphatase activities was observed in the internal organs, especially in the liver, kidneys, myocardium, and gastric and intestinal mucosa.

76-1807. Gatiatullin, N. N. (Dep. Pathoanat., N. E. Bauman Kazan' Vet. Inst., Kazan', USSR). **Patomorfologiya otravleniya zhivotnykh metilatsetonokhlorofosom-3. [Pathomorphology of methylacetonochlorophos-3 poisoning in animals.]** *Uch. Zap. Kazan. Vet. Inst.* 112: 338-341; 1972. (5 references) (Russian)

Poisoning symptoms and pathomorphological changes were studied in albino mice, rabbits, dogs, sheep, and piglets following acute oral or percutaneous poisoning with methylacetono-chlorophos-3. Animals treated with single 250-1,000 mg/kg doses in the form of a 2% solution exhibited stereotypical symptoms, such as excitation, salivation, emesis, tonic and clonic spasms, dyspnea, weak pulse, and motor coordination disturbances. Dilation of the heart, venous stasis, pulmonary edema, pericellular and perivascular edema of the brain, acute erosive gastroenteritis, edema of the mesenteric lymph nodes, focal hemorrhages of the myocardium, hyperemia of the internal organs, granular dystrophy of the convoluted tubules of the kidneys, and stasis and fatty degeneration of the liver were found on autopsy. The application of 1-2% solutions to the skin of rabbits produced no clinical symptoms. When the compound was applied in the form of 4-5% solutions on the skin of rabbits at a dose of 600 mg/kg, edema of the subcutaneous tissue around the application site was observed 1-6 days after application.

76-1808. Filip, Z. (Author address not given). **O pesticidech v pude. [Pesticides in soil.]** *Vesmir* 53(8): 243-244; 1974. (1 reference) (Czech)

The toxic and beneficial effects of herbicides, fungicides, fumigants, and insecticides were investigated soil. The persistence times of specific named pesticides were: aliphatic acids and carbamates, 2-12 weeks; phenoxyacetic acids, 1-6 months; benzoic acids and amides, 12-18 months; urea compounds three years; organochlorine pesticides, 17 years; and *s*-triazines, 6-18 months. The pesticides were used systematically and in varied combinations. In soil treated with herbicides, a decrease in the numbers of microorganisms, especially actinomycetes, was noted. High doses of insecticides may be fatal to the soil microflora and have been reported to have brought about significant changes in the microfauna. Fungicides and fumigants can result in sterilization of the ground and destruction of microorganisms vital to the food chain. Negative and positive effects on respiratory and enzymatic activities of the soil microorganims and on aminofication, nitrification, and mineral levels were also mentioned. In addition, the use of some pesticides was seen as a causative factor in the formation of a mutant adaptive enzyme in microorganisms which degrades carboxylic acid and chlorine based pesticides. The effects of pesticides on the development of soil microorganisms suggest a possibility for development of biosynthetic pesticides.

76-1809. Rejmanek, M. (Fac. Sci., Karlovy Univ., Prague, Czechoslovakia). **Pohyb DDT v zivotnim prostredi. [Effects of DDT on the living environment.]** *Vesmir* 53(8): 278-279; 1974. (Czech)

The effects of DDT on the environment, its effects on fish and birds, and the accumulation of DDT in humans via the food chain were investigated. Organisms observed included plankton, fish, and fish-eating birds, and prey fish. It was found that DDT hinders the metabolism of calcium and steroids, which are important for ovulation, in birds of prey, and has resulted in a 50 percent decrease in the birth rate of the white-tailed sea eagle (*Hailiaeetus albicilla*). The use of DDT also resulted in a decrease in the

numbers of worms and other soil animals. Research also indicated higher body levels of DDT in countries where people eat large amounts of fish. The medical significance of such accumulations is uncertain. It was concluded that while no fatalities in vertebrates have been recorded the ecological consequences of DDT and its hormonal effects makes its use and the use of other organochlorine pesticides undesirable.

76-1810. Delak, M.; Vucemilo, M. (Dep. Farmakol. Toksikol., Vet. Fak., Zagreb, Yugoslavia). **Protektivno djelovanje atropina u otrovanju s triklorfonom. [Protective effect of atropine in trichlorfon poisoning.]** *Vet. Arh.* 43(11/12): 294-298; 1973. (9 references) (Serbo-Croatian)

A study was made of the protective effect of atropine sulfate in trichlorfon poisoning. Single p.o. and s.c. doses of 300 and 30 mg/kg of atropine sulfate in 5% aqueous solution were given to white rats. Half of the animals received atropine sulfate and the other half served as controls. Immediately after receiving atropine sulfate, some of the animals were given trichlorfon p.o. at an LD50 dose. The atropine sulfate was given again at 6 and 12 hr, then at 24 hr intervals thereafter until equal mortalities were recorded in the experimental and control groups. From this study it was determined that atropine sulfate in a single dose of 300 mg/kg offers full protection to the white rat for 12 hr after a LD50 dose of trichlorfon when both are given perorally. The same amount of atropine sulfate given s.c. offers protection for 24 hr. This protective power drops to zero after 9 days in p.o. applications and after 5 days in s.c. application. It is concluded that one single p.o. or s.c. application of 30 mg of atropine offers partial protection for 4 days, and full protection for 12 hr in the case of p.o. application and for 24 hr after s.c. application.

76-1811. Todorov, D.; Yotov, Y.; Bratanov, V.; Sergyeva, D.; Yurukov, M. (Vet. Inst. Infect. Parasit. Dis., Sofia, Bulgaria). **Prouchvaniya vurkhu ostatuchnite kolichestva sevin i neguvon v mlyakoto pri protivoparazitno tretirane na ovetsi i kravi. [Sevin and neguvon residues in milk during antiparasitic treatment of sheep and goats.]** *Vet. Med. Nauki* 11(3): 9-15; 1974. (7 references) (Bulgarian)

The possible contamination of cow's and ewe's milk by sevin (carbaryl) and neguvon (trichlorfon) was studied during the antiparasitic treatment of the animals. Animals were treated according to the local practice, and some animals were also studied which had been treated under laboratory conditions prior to and after shearing. This showed that residual amounts of sevin and neguvon were found in cow's and ewe's milk as early as the 24th hour following the antiparasitic treatment of the animals. The excretion of sevin with cow's milk lasted up to the 10th day, and with ewe's milk up to the 11th day following treatment after shearing. When sheep were treated with sevin and neguvon prior to shearing, residual amounts of these preparations were found on the 22nd and 24th day following treatment. It is concluded that hygiene requirements must be strictly observed during milking in case the animals have been previously treated with antiparasitic agents in order to minimize the amounts of pesticides introduced.

76-1812. Yonova, I.; Zhecheva, G. (Vet. Inst. Infect. Parasit. Dis., Sofia, Bulgaria). **Ostatuchni kolichestva sevina, neguvon i imidan v meso na tretirani sreshu ektoparaziti svine. [Residues of sevin, neguvon, and imidan in the meat of pigs treated for ectoparasites.]** *Vet. Med. Nauki* 11(5): 28-34; 1974. (13 references) (Bulgarian)

A study was made of 56 one-year-old pigs which had been treated topically for ectoparsite control with sevin (carbaryl), neguvon (trichlorfon), and imidan (phosmet). The animals were killed in succession up to the 50th day after treatment. Pesticide residues were extracted from samples of kidney fat and meat from the thigh and shoulder as well as liver tissue by a modification of the method of Brewerton and Langlois. Subsequent estimations were carried out by McRae and McKinley's method using thin-layer chromatography. The results of the study indicated that the pesticides penetrated through the skin for 2 to 5 days. They accumulated predominantly in the s.c. fat, sevin at 10 ppm, neguvon at 12 ppm, and imidan at 10 ppm. Also they accumulated partly in the meat: sevin at 6 ppm, neguvon at 7 ppm, and imidan at 8 ppm. The metabolism of the pesticides was also followed and several metabolites were identified.

76-1813. Cooper, J. E. (Vet. Res. Lab., Kabete, Kenya). **Trichlorphon as a safe insecticide for use on birds of prey.** *Vet. Rec.* 94: 455; 1974. (6 references)

The successful use of an aqueous solution of trichlorphon, at 0.15%, on thirteen birds of prey for the control of mites and lice is reported. The birds included members of the species: *Milvus migrans, Tyto alba, Polyboroides typus, Aquila rapax, Necrosyrtes monachus, Kaupifalco monogrammicus, Haliaeetus vocifer, Accipiter minullus, Hieraaetus fasciatus,* and *Bubo africanus*. The object of the particular experiments was to determine if the concentrations of the chemical safe for poultry were also safe for birds of prey. The standard concentration of 0.15% was sprayed onto the bird while it was being held by an assistant wearing gloves. Volumes used ranged from 10 to 100 ml, depending on the size of the bird. In some experiments volumes of 50 ml were given daily for seven days to determine if there were any ill effects due to repeated spraying. None of the birds showed clinical signs of toxicity following spraying, and all fed and behaved normally during the 48 hr after spraying. If toxicity has been encountered, atropine sulfate would probably have been an effective antidote.

76-1814. Collet, G. F.; Pont, V. (Stn. Fed. Rech. Agron. Lausanne, Lausanne, Switzerland). **Distribution et**

metabolisme du methabenzthiazuron chez des especes vegetales. [Distribution and metabolism of methabenzthiazuron in susceptible or resistant plant species.] *Wed Res.* 14(3): 151-165; 1974. (23 references) (French)

Methabenzthiazuron (MBT) passes rapidly from the roots towards the leaves where it is more or less actively metabolized depending upon the species considered. In particular, the metabolic transformations of MBT allow the isolation of a relatively stable catabolite (hydroxymethyl-MBT). The latter is the origin of a metabolic pathway which gradually demethylates the urea chain. Additionally, some products of condensation with glucose have been identified. Several reversible metabolic reactions can also release MBT from certain of its metabolites. (Author abstract by permission)

76-1815. Golab, T.; Althaus, W. A. (Lilly Res. Lab., Div. Eli Lilly and Co., Greenfield, IN 46140). **Transformation of isopropalin in soil and plants.** *Weed Sci.* 23(3): 165-171; 1975. (19 references)

Field soil studies with ^{14}C-isopropalin (2,6-dinitro-*N*,*N*-dipropylcumidine) have demonstrated its biodegradability. None of the recognizable transformation products in soil accumulated beyond 4% of the amount of applied herbicide. After 15 months, approximately 25% of the applied isopropalin remained in soil, and less than 10% was observed after 28 months. Only negligible amounts of radioactivity were detected in crops grown in soil treated with the herbicide. Isopropalin and its recognizable transformation products were not detected in any of the plant tissues examined. Fractionation techniques indicated that the radioactivity was randomly distributed throughout the plant tissue. (Author abstract by permission)

76-1816. Sprankle, P.; Meggitt, W. F.; Penner, D. (Monsanto Co., St. Louis, MO 63166). **Adsorption, mobility, and microbial degradation of glyphosate in the soil.** *Weed Sci.* 23(3): 229-240; 1975. (8 references)

Glyphosate [N(phosphonomethyl)glycine] was readily bound to kaolinite, illite, and bentonite clay and to charcoal and muck but not to ethyl cellulose. Fe+++ and Al+++-saturated clays and organic matter adsorbed more glyphosate than Na+ or Ca+-saturated clays and organic matter. Glyphosate appears to be bound to the soil through the phosphonic acid moiety as phosphate in the soil competed with ^{14}C-glyphosate for adsorption sites. Glyphosate mobility in the soil was very limited and was affected by pH, phosphate level, and soil type. The ^{14}C-glyphosate was biodegraded in soil to $^{14}CO_2$ possibly by co-metabolism. Potentiometric titrations of the compound gave pKa values of 2, 2.6, 5.6, and 10.6. (Author abstract by permission)

76-1817. Mahoney, M. D.; Penner, D. (Stauffer Chemical Co., Mountain View, CA). **Bentazon translocation and metabolism in soybean and navy bean.** *Weed Sci.* 23(4): 265-271; 1975. (11 references)

Following foliar application of ^{14}C-bentazon [3-isopropyl-i*H*- 2,1,3-benzothiadiazmin-(4)3H-one 2,2-dioxide], a promising selective postemergence herbicide for the control of broadleaf weeds in soybean [*Glycine max* (L.) Merr.] and navy bean (*Phaseolus vulgaris* L.), the movement of the ^{14}C-label was primarily acropetal in both species, with some basipetal movement. Metabolism was more rapid in the trifoliate navy bean leaf than in the unifoliate navy bean leaf and the trifoliate soybean leaf. Prior treatment with several other herbicides did not decrease metabolism of bentazon in navy bean. The metabolites in navy bean and soybean appeared similar. Four apparent ^{14}C-conjugates were isolated from soybean plants harvested at full maturity. (Author abstract by permission)

76-1818. Stephenson, G. R.; McLeod, J. E.; Phatak, S. C. (Dep. Environ. Biol., Univ. Guelph, Guelph, Ontario, Canada). **Differential tolerance of tomato cultivars to metribuzin.** *Weed Sci.* 24(2): 161-165; 1976. (13 references)

Seedlings of fifteen different cultivars of tomato (*Lycopersicon esculentum* Mill.) varied greatly in tolerance to metribuzin [4-amino- 6-*tert*-butyl- 3-(methylthio)-*as*-triazine- 5(4H) one] applied at a concentrazion of 0.5 mg/l in quartz sand nutrient culture during the three-true-leaf stage. Tolerance increased with seedling age, but acceptable tolerance was observed about 6 days earlier in the tolerant 'Fireball' compared to the susceptible 'Heinz 1706.' Root uptake and acropetal translocation of metribuzin-carbonyl-^{14}C was similar in 2-week-old seedlings of susceptible Heinz 1706 and tolerant Fireball seedlings. Differential tolerance was related to the rate of detoxification by metabolism within the tomato leaves, which was approximately two-fold greater in the tolerant Fireball seedlings. (Author abstract by permission)

76-1819. Zufarov, K. A.; Nadzhimutdinov, K. N.; Tashkhodzhaev, P. I. (Dep. Histol. Pharmacol., Tashkent Med. Inst., Tashkent, USSR). **Reaktsiya pecheni na vozdeystviye geksakhlortsiklogeksana (eksperimental'noye issledovaniya). [Reaction of the liver to the action of hexachlorocyclohexane (experimental investigation).]** *Arkh. Patol.* 37(10): 49-55; 1975. (34 references) (Russian)

Morphological and ultrastructural changes in the liver as a result of exposure to hexachlorocyclohexane (BHC) were studied. Measurements were also made of changes in the weight of the liver, content of protein, glycogen, and total lipids. BHC caused a considerable increase in the weight of the liver and increased the levels of protein, glycogen, and total lipids. This was particularly pronounced after prolonged administration of BHC at 1/50 LD50. Doses of 1/3 LD50 brought about marked dystrophic changes in the liver similar to the type of hydropic degeneration, and accumulation of fatty drops in the hepatocytes. A dose of 1/50 LD50 increased the size of

hepatocytes with dystrophic changes being noted only in individual cells. High levels of RNA and glycogen were noted in hepatocytes. The changes noted by electron microscopy occurred mostly in the endoplasmic network of hepatocytes which were seen as an enlargement of the elements of the smooth endoplasmic reticulum. It is suggested that all the changes were associated with a stimulating effect of BHC on the microsomal system of th hepatocytes, i.e., on the enzymatic systems localized in the smooth endoplasmic reticulum.

76-1820. Lyr, H.; Ritter, G.; Banasiak, L. (Inst. Pflanzenschutzforsch. Kleinmachnow, Akad. Landwirtschaftswissensch. der DDR, 1532 Kleinmachnow, DDR). **Detoxication of carboxin.** *Z. Allg. Mikrobiol.* 14(4): 313-320; 1974. (18 references)

The mechanism of oxidation leading to a rapid inactivation of carboxin (DCMO) was studied. DCMO was rapidly oxidized by hydrogen peroxide or H_2O_2 generating systems such as riboflavin, and flavin enzymes with or without substrate to the more water-soluble nontoxic sulfoxide, DCMOS. The inactivation is enhanced by illumination. Peroxidase has no effect. Mitochondria isolated from sensitive as well as from insensitive fungal species were able to oxidize DCMO, leading to a leakage of the compounds mainly in the form of DCMOS from the mitochondria. Of the several fungal species studied, only *Ustilago maydis* in vivo oxidized DCMO to a high degree. The oxidation of DCMOS to the corresponding dioxide, plantvax or oxycarboxin (DCMOD), occurred under certain conditions and then only to a limited extent. Proteases were not able to attack the carboxamide bond. From the results of this study it is suggested that flavin enzymes are mainly responsible for the rapid oxidative inactivation of DCMO in vivo.

76-1821. Pal, R.; Brown, A. W. A. (Vector Biol. Contr., WHO, Geneva, Switzerland). **Problems of insecticide resistance.** *Z. Parasitenkd.* 45(2): 211-219; 1974. (33 references)

Resistance to insecticides has developed in 108 species of arthropods of public health importance. Many species have become resistant to almost all available insecticides and others are susceptible only to compounds that are too expensive for the developing countries to purchase for public health use. This paper traces the development of resistance in anopheline, culicine, and *Aedes aegypti* mosquitoes, as well as the *Culex* vectors of Japanese encephalitis lice, fleas, blackflies, triatoma, houseflies, ticks, and cockroaches, as well as the impact of this resistance on the control of the diseases they transmit. Although serious, the situation is not out of control, as many of the pests and vectors are susceptible to one or several insecticides over most of their range. The resistance which has developed is largely the result of campaigns carried out against other vectors, or most commonly the result of widespread use of agricultural pesticides. The variety of chemicals used is very great, since the problem of insecticide resistance in agricultural pest control is at least as serious, if not more so, than that in the pests which affect public health. Evidence is now available that there is a substantial degree of cross-resistance to the juvenile hormone mimics, chemosterilants, and even biological agents. Thus, resistance problems will be more and more difficult to solve in the future.

76-1822. Merenyuk, G. V. (Moldavian Sci. Res. Inst. Hyg. Epidemiol., USSR). **Vliyanie pestitsidov na pochvennye mikrobiologicheskie protsessy. [Effect of pesticides on soil microbiological processes.]** *Zdravookhranenie* 17(2): 16-19; 1974. (Russian)

The effects were examined of DNOC, *meta*-nitrophenol, copper sulfate, cuprosan, copper oxychloride, and cajbaryl on *Azotobacter*, red yeast, *Proteus*, coli bacteria, *Clostridia*, and anthrax bacillus. Most pesticides killed the microorganisms at concentrations of 2-5 g/liter. At concentrations of 1.5-17 mg/liter, DNOC killed *Azotobacter* and *Clostridia*, but coli required concentrations of 200-400 mg/liter for their destruction. All preparations were more powerful against gram-positive than against gram-negative microorganisms. Copper sulfate, DNOC and cuprosan depressed the soil microbiological processes at concentrations over 3 mg/kg, especially the nitrifying the cellulolytic bacteria. Anthrax bacillus, *staphylococcus aureus*, and red yeast bacteria were most susceptible to DNOC. DNOC, present in nutrient solutions at 400-500 mg/liter, was intensely metabolized by *Klostridium perfringens* A.

76-1823. Hermann, R. S.; Koransky, W.; Leberl, C.; Noack, G. (Inst. Toxikol. Pharmakol., Philipps Univ., Marburg, Germany). **Hyperplasia and hypertrophy of rat liver induced by α-hexachlorocyclohexane and butylhydroxytoluene. Retention of the hyperplasia during involution of the enlarged organ.** *Virchows Arch. B* 9(2): 125-134; 1971. (36 references)

A study was made of liver growth induced in rats by the administration of α-HCH or of BHT in an effort to determine the degree of reversibility of the drug effect. Liver mass increased following treatment with either drug to both hypertrophic and hyperplastic changes. Liver weight, liver DNA and the number and degree of ploidy of nuclei all increased in the treated rats. The 400 mg/kg dose of α-HCH produced greater increases in these 4 parameters than did the 200 mg/kg dose level. In each case the increase in liver mass produced by the two dosages of α-HCH and by the 500 mg/kg dose of BHT was greater than the increase in DNA content. With either drug the percentage increase in the number of liver cell nuclei was, on the average, smaller than the increase in total DNA, yet there was a concomitant rise in the relative number of tetraploid nuclei. Thus, the DNA content was augmented due to both multiplication and polyploidization of nuclei. After reaching a maximum, liver mass returned to control

values in about 2 weeks. However, the hyperplastic state of the organ remained unchanged during the 7 week followup period. It is concluded that current ideas concerning the easy reversibility of drug-induced liver growth in the rat are valid only for the hypertrophic, but not for the hyperplastic component of the growth process.

76-1824. Vijan, P. N.; Rayner, A. C.; Sturgis, D.; Wood, G. R. (Air Qual. Lab., Minist. Environ., Toronto, Ontario, Canada). **A semi-automated method for the determination of arsenic in soil and vegetation by gas-phase sampling and atomic absorption spectrometry.** *Anal. Chim. Acta* 82(2): 329-336; 1976. (7 references)

A semi-automated method for the determination of arsenic in soil and vegetation is described. The samples are digested with a perchloric-nitric acid mixture, and the diluted solutions are treated with sodium borohydride solution in a Technicon sampler fitted with a proportioning pump. The resulting mixed stream of gases and solutions is swept into a gas-liquid separator by an argon stream. The gas phase is passed through a heated quartz cell aligned in the optical path of an atomic absorption spectrometer equipped with an arsenic hollow-cathode lamp. The atomic absorption at 193.7 nm is recorded. Forty samples a day can be analyzed. Relative standard deviations are less than 4% for vegetation samples, and 7% for soil samples. The detection limit is 0.15 μg/g for both vegetation and soils. (Author abstract by permission)

76-1825. Brownrigg, J. T.; Hornig, A. W. (Baird-Atomic Inc., Bedford, MA 01730). **Identification of PCB's in the presence of DDT-type compounds using low temperature luminescence.** *Arch. Environ. Contam. Toxicol.* 4(2): 175-182; 1976. (16 references)

Low-temperature (77°K) luminescence spectra of polychlorinated biphenyls (PCBs), DDT-type compounds, and mixtures suggest a simplified method for identification and quantitation of aromatic pesticides with minimal prior sample treatment. Spectral differences allow identification of PCBs in the presence of DDT and the converse. Approximate detection limits, possible interferences, and suggestions for further work are discussed. (Author abstract by permission)

76-1826. Ja, B. Y.; Piedade, J. R.; Yoneda, H.; Matsunaga, A. K.; Vasques, R. M. P. (Stauffer Chem. Co., Westport, CT 06880). **Analysis of herbicide thiocarbamates by gas chromatography.** *Arq. Inst. Biol.* 40(3): 197-199; 1973. (2 references)

A gas-liquid chromatographic procedure for the analysis of herbicide thiocarbamate formulations is described. The 6 ft × 2 mm I.D. Pyrex glass, aluminum, or stainless steel chromatographic column is packed with 3% SE-30 or OV-1 on 60/80 mesh gas Chrom Q and 3% OV-17 on 60/80 mesh gas Chrom Q. The instrument is equipped with a flame ionization detector, the injection port temperature is 225°C, the column temperature is 130-150°C, and the detector temperature is 250°C. The nitrogen carrier gas flows at 30-35 ml/min, the hydrogen gas flow rate is 25-30 ml/min, and the air flow rate is 200 ml/min. Eptam (EPTC), ordram (molinate), Ro-Neet (cycloate), sutan (butylate), tillam (pebulate), or vernam (vernolate) is used as an internal standard. The method described allows specific and accurate analysis of the thiocarbamate herbicides.

76-1827. Smith, C. A.; Gunther, F. A.; Adams, J. D. (Dep. Entomol., Univ. California, Riverside, CA 92502). **Worker environment research. III. A rapid method for the semiquantitative determination of some dislodgable pesticide residues on citrus foliage.** *Bull. Environ. Contam. Toxicol.* 15(3): 305-310; 1976. (6 references)

A method was developed for rapid and convenient field measurement of dislodgable pesticide residues on citrus foliage. The method is suitable for phosphorothionates, phosphorodithioates, and phosphates. It consists of three steps: transfer of a known "area" of dislodgable pesticide residues from one or more leaves to a porous paper strip using a specially designed sampler; separation of the compounds in question from the material removed from the foliage using paper chromatography; and development on the paper strip of a color with an intensity proportional to the quantity of OP compounds removed. The minimum detectability afforded by this technique is about 0.05 μg total OP residue/cm² leaf surface sampled. No interferences resulting from the dust, plant pigments, and waxes removed from orange leaves have been encountered with the acetone-water solvent system used to separate the OP residues from the extraneous residues removed from the leaf.

76-1828. Bidleman, T. F.; Rice, C. P. (Dep. Food Resource Chem., Univ. Rhode Island, Kingston, RI 02881). **TLC analysis of carbaryl insecticide on sprayed foliage. A student experiment.** *J. Chem. Educ.* 53(3): 173; 1976. (2 references)

Thin-layer chromatography is developing into an important analytical method in the area of carbamate pesticide analysis. One day after aerial spraying with carbaryl to control a gypsy moth infestation, a large number of leaves were collected and frozen for carbaryl analysis. The extraction-cleanup procedure was adopted from Johnson and Stanbury's crop residue method and the foliage extract was chromatographed on thin-layer plates along with standards of carbaryl and 1-naphthol. After development, the plate was sprayed with sodium hydroxide, which hydrolyzed carbaryl to produce the intensely blue fluorescent anion of 1-naphthol. Carbaryl and 1-naphthol can be quantitatively determined by measuring the fluorescence in situ with a scanning fluorimeter. This method achieved 80% recovery of both carbaryl and 1-naphthol from a sample fortified with each at a 40-ppm level.

76-1829. Viscido, A. A.; Zamora, M. M. K. (Tucuman Nat. Univ., San Miguel de Tucuman, Argentina). **Determinacion fotocolorimetrica de paration. [Photocolorimetric determination of parathion.]** *Jornadas Argent. Toxicol. Anal. Actas* 1: 1-16; 1971. (9 references) (Spanish)

A reduction process is suggested as a new method for determining parathion. The resulting amine is insoluble in water and can be diazotized with sodium nitrite and an acid, then conjugated with bilirubin. The procedure is as follows: to one ml of whole blood, add 5 ml of a 12% ssolution of trichloroacetic acid. Centrifuge. Extract parathion from the liquid phase with benzene. Treat the benzene

solution with powdered zinc and concentrated hydrochloric acid. Boil off solvent. Filter. Add one ml of a 0.5% sodium nitrite solution and maintain at a temperature of 0.40°C until diazotization takes place. Add 5 ml standard bilirubin solution; this should give a characteristic pink color, which after 15 minutes is read on a photocolorimeter at a wavelength of 530 microns. Compare with a calibration curve obtained from a standard parathion sample.

76-1830. Paez, D. M.; Farah, M. (Fac. Cienc. Fis. Quim. Matemat., Univ. Cuyo, San Luis, Argentina). **Metodo rapido para la determinacion de pesticidas fosforados en sangre por cromatografia en microplacas. [Rapid method for detecting organophosphate pesticides in blood by miniplates thin-layer chromatography.]** *Jornadas Argent. Toxicol. Anal. Actas* 1: 12-17; 1971. (7 refererfces) (Spanish)

The use of silica gel mini-plates, 7 × 4 cm in size, comprises an economical, rapid, and efficient method for identifying parathion, malathion, and some of their metabolites in blood and other biological fluids and tissues, with additional applications in the determination of food residues. Semiquantitative analysis can be performed with the use of references standards. Extraction from whole blood is done with diethyl ether and petroleum ether. The extract is deposited on 7 × 4 cm films of silica gel G, using 5-10 microliters per sample. The chromogenic reagents are an acetone solution of 4-(*p*-nitrobenzyl)-pyridine and an acetone solution of bromphenol blue. Reference solutions of parathion and malathion in ethyl acetate are also used. The extraction procedure is a modification of the technique of Heyndrickx et al. The method is sensitive to one microgram of the pesticide per ml of blood and requires 30-40 minutes at most for its performance. Only 5-10 ml of solvent is needed for each sample.

76-1831. Vonesch, E. E.; Riveros, M. C. K. (Chem. Dept., Sch. Agric. Vet. Med., Univ. B.A., Buenos Aires, Argentina). **Reconocimiento y determinacion de carbarhl en formulaciones mojables. [Detection and analysis of carbaryl in wettable powder preparations.]** *Jornadas Argent. Toxicol. Anal. Actas* 1: 34-39; 1971. (11 references) (Spanish)

A chemical reaction with diazotized 2,5-dichloroaniline may be used to detect the presence of arylam (Sevin, carbaryl) in wettable powders used for insecticidal purposes. The reagents used are a solution of 2,5-dichloroaniline sulfate (prepared by mixing dichloroaniline with sulfuric acid) and potassium nitrate. Addition of the insecticide to a mixture of these two reagents causes a red color to appear. The reaction is sensitive to 0.1 μg of carbaryl in concentrations of at least 0.2 ppm. Photocolorimetric determination may be used in conjunction with a reference solution to obtain quantitative results. A photocolorimetric calibration curve may be drawn between 3 and 40 micrograms. For a volume of 10 ml, this curve is linear.

76-1832. Riveros, M. C. K.; Vonesch, E. E. (Chem. Dep., Sch. Agric. Vet. Med., Univ. B.A., Buenos Aires, Argentina). **Determinacion colorimetrica del carbaryl en acelga, lechuga, manzana y tomate. [Colorimetric determination of carbaryl in swiss chard, lettuce, apples, and tomatoes.]** *Jornadas Argent. Toxicol. Anal. Actas* 1: 44-50; 1971. (12 references) (Spanish)

A specific color reaction of arylam (carbaryl) with diazotized 2,5-dichloroaniline, described in a previous article (Abstract No.-76-1831), was utilized to determine residues of this insecticide in Swiss chard, lettuce, apples, and tomatoes. The food substances were ground and homogenized before determination. Color was read with a spectrophotometer set for a wavelength of 510 nm. Samples varied in weight from 10 to 35 grams, and the arylam content varied from 4 to 32 ppm. Recovery levels of the insecticide were 91.7-105% for apples, 89.6-102.5% for lettuce, 91.7-102.0 for Swiss chard, and 87.5-105.0 for tomatoes. In another test, "fortified" samples were prepared by injecting the Swiss chard, lettuce, and tomatoes with varying quantities of 85% arylam. The results of determinations made on these samples were comparable to those in the first part of the experiment. The dichloroaniline test sensitivity is 0.1 μg of insecticide, and is determined by the spectrophotometer sensitivity. The color appears within 10-15 minutes and lasts for another 15-20 minutes. The arylam was extracted from the vegetable pulp with methylene chloride and the pulp was coagulated with zinc sulfate. The recovery range is 4-22 ppm and samples may vary in size from 10 to 35 grams.

76-1833. Gotelli, C. A. (Dep. Toxicol., Sch. Med., Univ. B. A., Buenos Aires, Argentina). **Tecnica para la determinacion de plaguicidas organo-clorados en medios biologicos. [Method of determining organochlorine pesticides in biological media.]** *Jornadas Argent. Toxicol. Anal. Actas* 1: 103-105; 1971. (Spanish)

The rapid determination of organochlorine compounds in toxicological cases formerly required the use of elaborate equipment such as is usually found in large population centers, whereas pesticide poisoning usually occurs in the rural areas. The method of Luckens, et al., using thin layer chromatography, was published in 1970 and seems the most suitable method for emergency toxicological determinations. It has been shown that the most useful determinations in cases of suspected organochlorine poisoning are done on samples of whole blood, because of the pesticide's affinity for the red cells. Details are given on the modification of this method used at the University of B. A., which is sensitive to concentrations of about 0.1 ppm of the pesticide in blood or urine. It is 85% accurate for DDT, 92% for dieldrin, and 80% for aldrin.

76-1834. Gomez Artero, J. (Nat. Inst. Indust. Technol., Buenos Aires, Argentina). **Anomalias en cromatografia en fase gaseosa. [Irregularities in gas chromatography.]** *Jornadas Argent. Toxicol. Anal. Actas* 1: 157-164; 1971. (Spanish)

Irregularities that can occur during gas chromatography can be classified under three headings: occurrence of peaks that do not correspond to any of the sample components (caused by thermal isomerization or decomposition of a component in the injector or column, reactions with the stationary phase, adsorption-desorption phenomena), disappearance of peaks corresponding to sample components, alterations of retention time (caused by residual activity of the substrates, saturation of the column, or interaction with other components in the sample). Precautions to take when such anomalies are noted are: keeping the injection system immaculately clean (ultrasonic cleaners are recommended), running tests on the column (method of Burchfield and Storrs), testing standard samples of the components involved, running the sample at different column temperatures, and making other test runs in which temperatures are kept constant.

76-1835. Zerba, E. N. (Sci. Tech. Res. Inst., F.F.A.A., Buenos Aires, Argentina). **Importancia de la columna cromatografica en el analisis de residuos de pesticidas por cromatografia gaseosa. [Importance of the chromatography column in the analysis of pesticide residues by gas chromatography.]** *Jornadas Argent. Toxicol. Anal. Actas* 1: 165-168; 1971. (12 references) (Spanish)

A critical factor in the accuracy and reliability of pesticide residue detection is the chromatography column. Because of the catalytic action of metallic surfaces on such pesticides as endrin, it is advisable to use a glass tube or a metal onescoated with Teflon. The length of the column should be at least 1.8 meters; the maximum length is a function of the substrate employed. Diameters can be 0.25-0.12 inch. The smaller the size of packing particles, the greater the efficiency, within certain limits. For a 1.8 meter column, 0.12 inch in diameter, the substrate grain size of 100-120 is optimum. In the selection of a proper substrate and a liquid phase, adsorption and decomposition are important. Adsorption, usually related to the highly polar silanol radicals, can be controlled either by chemical reactions, such as with dimethylchlorosilane, or by saturation, i.e., surrounding the field of action with a "shield" of inert material. The column may also be injected with high concentrations of the adsorbable substances. Polyezhylene glycol (Carbowax) has been found effective here. Catalytic action is controlled by the use of an acid eluent that eliminates catalytic metallic oxides. The useful lifetime of a column can be lengthened by protecting it from unnecessary adsorption and deterioration, the presence of lipids being a deteriorating factor. OV17-QF-1 is recommended as the liquid phase when analyzing insecticide residues.

76-1836. Paez, D. M.; Farah, M. (Toxicol. Forens. Chem., Sch. Phys. Sci., Chem. Math., Cuyo Nat. Univ., San Luis, Argentina). **Separacion por cromatografia en microplacas de algunos metabolitos de parathion. [Thin layer chromatographic separation of some metabolites of parathion.]** *Jornadas Argent. Toxicol. Anal. Actas* 1: 169-172; 1971. (7 references) (Spanish)

In tracing the course of parathion metabolism in rats, thin layer chromatography was used to identify the products of metabolism. Films of silica gel G and neutral F-254 aluminum oxide (type T) were used in conjunction with binary and ternary solvent systems to determine the *Rf* values of parathion and its metabolites (isoparathion, *p*-aminoparathion, paraoxon, methylparaoxon, *p*-nitrophenol), using brilliant green (C. I. 42040) and DCQ as chromogenic reagents. The use of the microfilm process was found to be economical in terms of working time and quantities of reagents, and results are comparable to those of more conventional methods.

76-1837. Baba, H.; Sakurai, H.; Takaoka, Y.; Kuwayama, T.; Aoki, A. (Agric. Chem. Inspec. Stn., Minist. Agric. For., Kodaira, Tocyo, Japan). **[Quantitative determination of ezomycin by bioassay using *Botrytis cinerea* and *Sclerotinia cinerea*.]** *Nogaku Kensasho Hokoku (Bull. Agric. Chem. Inspect. Stn.)* (15): 77-81; 1975. (Japanese)

Methods of biological assay for ezomycins A and B (antibiotic pesticides) were examined by a cup technique. Of 150 species of phytopathogenic microbes tested, the bacteria and yeasts were not sensitive to the ezomycins, but *Botryis* spp. and *Sclerotinia* spp. were highly sensitive. *Botrytis cinerea* ACI 1166 showed a normal distribution to an accuracy of 6.33% when its conidia were produced in potato-agar medium and examined on pectin-supplemented potato agar medium, showing a clear inhibition circle with 5 μg of ezomycin A. *Sclerotinia cinerea*, when cultured in actinomycete medium, cut into pieces, and examined in pectin/glucose-supplemented potato agar medium at a pH of 5.5, was able to detect 5 μg of ezomycins with an accuracy of 15%. Ezomycins A and B gave two parallel standard curves with both fungi. Ezomycins A and B showed an additivity of 100.4%.

76-1838. Valange, B.; Henriet, J. (Lab. Chim., Stn. Phytopharm. Etat, Gembloux, Belgium). **Caracteristiques chimiques et physico-chimiques des formulations a base de quintozene. [Chemical and physicochemical characteristics of quintozene formulations.]** *Parasitica* 29(2): 93-103; 1973. (2 references) (French)

Fourteen formulations of pentachloronitrobenzene were analyzed by four methods: determination of total organic chlorine content (classical metallic sodium method), polarography, infrared spectrophotometry, and gas chromatography. Particle size was determined by dry sieving. The chloroform extract was also examined. The data indicates that the results obtained with all four methods are virtually the same. Gas chromatography, however, is the only method capable of detecting hexachlorobenzene (HCB); 7 formulations were shown to contain HCB. Results for the chloroform extract are in

accordance with those obtained with the other methods. The particle size distribution varies appreciably depending on the commercial origin of the formulation. In order to establish specifications, it is necessary to establish a correlation between the size of the particles determined by sieving and biological efficacy.

76-1839. Anonymous. **Automatische bepaling van pesticiden in voedsel. [Automated determination of pesticides in food.]** *Procestechniek* s30(26): 877-879; 1975. (Dutch)

An apparatus for the automated analysis of pesticides in food was developed, based on lipid chromatographic separation of the pesticides, followed by their detection with an electron-capture detector. The process entails four operations: (1) preparation of the sample, (2) separation, (3) detection, and (4) determination. A milk sample is treated with dilute sulfuric acid to separate the pesticide-containing fat from the milk. The fat is separated and extracted with hexane. The hexane is then dried and cleaned of acid traces and milk debris. A small quantity of the hexane is introduced into the liquid chromatograph, separating the hexane from the fat and the pesticides, which are then divided into two groups. The former group moves into the second column while the latter group is broken down into its components, which are then passed into the detector one by one, determined, and recorded. The fat is then determined refractometrically.

76-1840. Segebade, C. (Bundesanst. Materialpruef., Berlin-Dahlem, Germany). **Quantitative Brombestimmung in einem Pflanzenschutzmittel durch Aktivierungsanalyse mit 14 MeV-Neutronen. [Quantitative bromine determination in a pesticide by 14 MeV neutron activation analysis.]** *Radiochem. Radioanal. Lett.* 15(4-5): 251-260; 1973. (9 references) (German)

A method is described for gamma-spectrographic analysis of the bromine content of the brominated pesticide Naled (dibrom) by neutron activation analysis with 14 MeV neutrons. A 400-channel analyzer and computer with printer were used for the evaluation of the gamma-spectra. Bromine amounts of 50-300 μg could be determined within about 15 minutes. The radionuclides ^{30}P, ^{34}Cl, and ^{34}mCl caused a certain interference.

76-1841. Rivera, M. (Dep. Biochem., Natl. Lab. Diagn. Investig. Vet., Cuba). **Un metodo para la valoracion de paraquat en la investigacion toxicologica. [A method for the evaluation of paraquat in toxicological investigations.]** *Rev. Cub. Pharm.* 7(1): 59-63; 1973. (4 references) (Spanish)

Following the accidental poisoning of geese with Gramoxone (paraquat), a new colorimetric method was devised for the quantiative determination of its active ingredient (a water-soluble quaternary pyridyl derivative) in internal organs (liver, kidney, or intestinal contents) of dead birds. The paraquat is extracted by first suspending homogenates of the organs (5-20g ± 0.001g) in distilled water in 1:1-1:2 proportions; the suspension is centrifuged, then deproteinated by heating on a water bath at 80°C for 5 min., centrifuged again, protected against oxidation with liquid petrolatum, and treated with 85% pure sodium hydrosulfite (sodium dithionite; BDH 30136), 1% soln. in 0.1 *N* sodium hydroxide. This reducing agent develops a blue color. The colorimetric determination is then carried out with a spectrocolorimeter. The results are calculated from direct readings of a previously established standard curve with various concentrations of paraquat plotted against their extinction coefficient. This method should be useful for diagnosing poisonings by Gramoxone.

76-1842. Midio, A. F. (Dep. Clin. Toxicol. Anal., Sch. Pharm., Univ. Sao Paulo, Brazil). **Kromatografia em camada delgada de alguns insecticidas organofosforados e nitrogenados [Thin layer chromatography of various organophosphorus and nitrogen containing insecticides]** *Rev. Farm. Bioquim. Univ. Sao Paulo* 11(1): 105-110; 1973. (12 references) (Portuguese)

An analytical chemistry study investigated the value of certain solvent-adsorbent-chromogenic agent systems in the thin-layer chromatographic detection of parathion, methyl parathion, malathion, systox, diazinon, dipterex (trichlorfon), Sevin (carbaryl), and Baygon (propoxur), all in 0.5-5 μg amounts. The determinations were carried out with a standard apparatus using silica gel G (Kiselgel G) and aluminum oxide G (alumina G) as adsorbents, 4:1 *n*-hexane-acetone, 75:25:5 cyclohexane-aketone-chloroform, and 1:1 *n*-hexane-chloroform as solvent systems, and 5% palladium chloride (10% hydrochloric acid) and rhodamine B (0.25% in ethanol, then 10% sodium carbonate) as chromogenic agents. The tabulated results indicated that all solvent systems were effective when silica gel G was used as adsorbent. The 1:1 *n*-hexane-chloroform + silica gel G system was the most effektive, and rhodamine B was more sensitive than palladium chloride.

76-1843. Piechocka, J. (Dep. Food Anal., Natl. Inst. Hyg., Warsaw, Poland). **Oznaczanie octanu fentinu w ziemniakach. [Determination of fentin acetate in potatoes.]** *Rocz. Panstw. Zakl. Hig.* 27(1): 27-32; 1976. (14 references)

Fentin acetate (triphenyltin acetate) was determined in potatoes by a colorimetric method using catechol violet. Before analysis, the samples were mineralized by two methods: direct mineralization of potatoes with a mixture of sulfuric, nitric, and perchloric acids, or mineralization of aqueous-acetone extracts. Detectability using the first method of mineralization was 0.3 mg/kg and with the second it was 0.05 mg/kg.

76-1844. Kiely, M.; O'Sullivan, M. (Comhlucht Siuicre Irelandann, Teo, Eire). **Applications of chromatography in the sugar industry with special reference to gas liquid**

chromatography (GLC). *Sucr. Belge* 95(3): 83-94; 1976. (16 references)

This paper presents work conducted on application of chromatographic techniques to the sugar industry and the ensuing analytical results. Lactic and volatile acids were determined in syrups, molasses, and factory effluents and wash waters by the gas-liquid chromatographic methods of Kiely and O'Drisceoil. Some of the methods used to analyze carbohydrates are discussed. An enzymatic method for measuring the raffinose content of the sugar beet is presented. A method for the determination of organochlorine pesticide residues in sugar by gas-liquid chromatography using an electron capture detector is described. Although organochlorine pesticides were not widely used in Ireland, examination of sugar, beets, and soil was considered necessary. Minute quantities of residues (nanogram range) were found. Organochlorine residues are detected by electron capture rather than the flame ionization detection generally used for sugar analyses.

76-1845. Mestres, R.; Tourte, J.; Campo, M. (Lab. Chim., Fac. Pharm. Montpellier, Cedex, France). **Note sur le dosage des residus de benomyl, de thiabendazole, et de thiophanate dans les fruits ou les legumes, separement ou associes. [Determination of benomyl, thiabendazole, and thiophanate residues, simultaneously or individually, in fruits and vegetables.]** *Trav. Soc. Pharm. Montpellier* 34(2): 131-140; 1974. (10 references) (French)

Thiabendazole in hydrochloric acid solution has a maximum in its absorption spectrum at 303 nm with two peaks at about 215 and 318 nm. In the same solution BCM (carbendazim) has maxima at around 275 and 282 nm. Thus, when both fungicides are present in the same extract, their qualitative identification is assured by the clearly different absorption spectra. In the presence of 10 mg of thiabendazole/liter of extract, the limit starting from which BCM can be perceived is 0.5 mg; conversely, 0.5 mg of thiabendazole/liter of extract is detectable in the presence of 6.6 mg of BCM. Quantitative determinations will also be accurate For thiabendazole, at concentrations of 0.5-10 mg/liter, there is no interference from 6.6 mg doses of BCM. Beyond such levels dilution becomes necessary since the absorption would be too intense. Determination of BCM is only possible by measuring the emergence of the main peak, between 282 and 285 nm. Measurements will only be correct if the total optical density is less than to 0.8 units, i.e., when the sum of thiabendazole and BCM does not exceed 10 mg/liter. Beyond these limits, measurements are inaccurate since the optical density on emergence of the peak is no longer proportional to the BCM concentration. Dilution will again permit detection of the accurate concentration of BCM in the mixture. In content to the determination of thiabendazole, the determination of BCM is only accurate, since the absorption measured is low. Separation of BCM and thiabendazole by selective extraction is based on their different separation coefficients in ethyl acetate and chloroform in the presence of dimethyl formamide; BCM is hardly extracted by chloroform, while thiabendazole is extracted more extensively. Following extraction of the latter by chloroform, BCM is extracted with ethyl acetate. The UV spectra can then be obtained separately for each fungicide.

76-1846. Sergeyeva, D. (Vet. Inst. Infect. Parasit. Dis., Sofia, Bulgaria). **Prouchvane na metodite za poluchvane na chist ekstrakt ot khranitelni produkti za dokazvane na fosfororganichni i karbamatni pestitsidi. [Production of a pure extract of food products for the detection of organophoshorus and carbamate pesticides.]** *Vet. Med. Nauki* 11(5): 64-70; 1974. (14 references) (Bulgarian)

A technique was developed for extration and purification of organic phosphorus and carbamate pesticides from milk and dairy products. It is a modification of Brewerton's technique for the demonstration of organochlorine pesticides. The fat containing the pesticides is isolated from the product with chloroform, and 2 to 3 g of it is diluted in 20 cm^3 *n*-hexane. The resudual pesticides are extracted by treatments with 30 cm^3 of acetonitrile. The acetonitrile is diluted with water, then chloroform is added, and the residues are distributed in the latter. The final purification is peroformed by chromatography on a florisil column and elution with chloroform. The chromatograms are done on a mobile phase of benzene and acetone in a 9:2 ratio. After air drying they are developed with $PdCl_2$ or bromine vapors in combination with a diazo salt of sulfanilic acid. They are identified by their *Rf* values and the color they assume. Quantification is carried out visually by comparing the sizes of the spots and the intensity of color of the sample with a standard. The method is useful for determining organic phosphorus and carbamate pesticides in milk, meat, viscera, fats, blood, serum, etc. With butter, milk, white brine cheese, yellow cheese, curds and whey, the method is effective in establishing amounts as low as 0.4 ppm.

76-1847. Tsetkova, T.; Sergeyeva, D.; Hristodorova, V.; Todorova, M. (Vet. Inst. Infect. Parasit. Dis., Sofia, Bulgaria). **Sravnitelni prouchvaniya vurkhu tunkosloyonokhromatografskite metod za opredelyane na ostatuchni kolichestva ot khlor- i fosfororganichni pestitsidi. [Comparative studies of thin-layer chromatographic methods for determining residual amounts of chlorine containing organophosphorus pesticides.]** *Vet. Med. Nauki* 11(5): 82-86; 1974. (11 references) (Bulgarian)

Studies were made of a total of 129 pure samples of 4 chlorine-containing organophosphorus preparations, neguvon (trichlorfon), nogos (dichlorvos), trichlorometaphos (ronnel), and ruelene (crufomate). Attempts were made to differentiate the samples by TLC as organochlorine compounds and as organophosphorus compounds. However, the results obtained were not dependable in terms of sensitivity, stability, and readability of results. A number of conditions were tested regarding the sorbent, mobile phase, and developer to determine the

most appropriate methods for thin-layer chromatography of the samples. The best results were obtained with silica gel DG sorbent, toluene:acetone 85:15 as the mobile phase, and a 0.5% solution of *o*-toluidine in acetone as color developer. The chromatogram presents well delineated, permanently stained, and distinct spots. This method proved highly sensitive. The minimal concentrations of pure substances which are determinable on the order of one μg or faction of a μg. This is a 5- to 10-fold higher sensitivity than that achieved with methods taking into account only the active organophosphorus centers.

76-1848. Zatula, A. I.; Nevzorov, M. I.; Khaylovich, Yu. A. (VNIIVO, USSR). **Opredelenie malykh kolichestv propanida i 3,4-dikhloroanilina v vode metodom gazozhidkostnoy khromatografii. [Determination of small amounts os propanide and 3,4-dichloroaniline in water by gas-liquid chromatography.]** *Vodosnabzh., Kanaliz., Gidrotekh. Sooruzh.* 17: 70-72; 1974. (Russian)

A gas-liquid chromatographic method is described for determining small amounts of propanide (propanil) and its metabolite, 3,4-dichloroaniline, in water. Following extraction with hexane and expulsion of the solvent, part of the sample is taken up in hexane. Propanide is determined in the portion on a gas chromatograph with a $^{94}Pu_{239}$ detector, using 5% silicon SE-30 on chromaton-N AW-DMCS, a column temperature of 190°C, a detector temperature of 230°C, and an evaporator temperature of 220°C. The other part of the sample is brominated for gas chromatographic determination in the form of 3,4-dichloro-6-bromoaniline. At a relative error of ±5%, the sensitivity of the determination amounts of 2 μg/liter for propanide and 0.2 μg/liter for 3,4-dichloroaniline.

76-1849. Prosic, Z.; Jovanovic, D. (Inst. Health, Milit. Med. Acad., Yugoslavia). **Odredivanje sadrzaja organofosfornih pesticida u vodi i namirnicama preko fosfora. [Determination of organophosphorus pesticide levels in water and foods with the use of phosphorus.]** *Vojnosanit. Pregl.* 32(1): 21-24; 1975. (18 references) (Serbo-Croatian)

Studies were conducted on 16 organophosphorus pesticides (8 dithiophosphates and 8 monothiophosphates), 7 thionophosphates, and 1 thiolophosphate. Pesticides content was determined by a conventional spectrophotometric method, utilizing the reaction of phosphorus with molybdenum blue when the organophosphorus compound is converted to an orthophosphate. Used in conjunction with thin-layer chromatography, this method is specific for all organophosphorus pesticides. Determinations of pesticide residues were made in water, beans, wheat, bread, and potatoes after extraction with an organic solvent. With the exception of the water, all the specimens contained a certain amount of vegetable coextractives, which was removed by column chromatographic adsorption. The cleaned-up extracts were then separated, identified, and quantitatively determined by the abovementioned method. The lower level of sensitivity of this method is 20 μg per 10 ml of solution, which permits determination of the pesticides at a concentration of 0.2 ppm, which is lower than the permissible limit set by the official code for pesticide concentrations in human and animal food. This sensitivity can also be increased by the use of a larger sample, especially in the case of water testing. The method is extremely simple, is not time-consuming, and does not require special equipment.

76-1850. Bouchet, F.; Dagneaud, J. P. (Inst. Tech. Cereales Fourrages, Paris, France). **Description d'une methode de dosage biologique de la simazine dans le sol. [Description of a bioassay technique for simazine in soil.]** *Weed Res.* 14(3): 145-149; 1974. (3 references) (French)

A bioassay method for the determination of simazine in the soil was perfected using white mustard (*Sinapis alba* L.) and oat (*Avena sativa* L.) as the reference plants. The samples of soil studied were taken from plots treated annually with simazine at 1, 3, or 6 kg/ha for 10 years. The bioassays, the results of which can be statistically interpreted, revealed only very small quantities of herbicide (0.25 to 0.48 kg/ha of active ingredient in plots treated at 6 kg/ha), whereas amounts two or three times greater were detected by chemical analysis. (Author abstract by permission)

76-1851. Allen, T. J.; Dodd, J. D.; Prince, D. K. (Res. Ext. Cent., Vernon, TX 76384). **Hexaflurate in soils and plants.** *Weed Sci.* 24(2): 209-213; 1976. (4 references)

A clean-up procedure for soil and plant samples utilizing a non-ionic exchange resin column followed by treatment with lead acetate was developed for determining microgram quantities of hexaflurate (potassium hexafluoroarsenate) spectrophotometrically. The method is sensitive to 0.45 ppm with a standard deviation of 0.09 ppm with a recovery of better than 85%. Samples high in organic matter require this treatment to remove interfering substances. Soil samples containing little or no organic matter could be analyzed by using either the lead acetate treatment or the non-ionic exchange resin column. Soil and plant samples analyzed 5 to 7 yr following treatment of south Texas soils for picklypear (*Opuntia* spp.) control were found to contain trace quantities of hexaflurate. Downward movement of hexaflurate is either very slow or plants continually assimilate the ion and redeposit it on the soil surface through decomposition of plant parts. The tri- and pent-oxide forms of arsenic did not interfere with analysis of the hexaflurate ion using the clean-up procedure. (Author abstract by permission)

76-1852. Ogata, H.; Saito, E.; Murata, H.; Shibazaki, T.; Inoue, T. (Natl. Inst. Hyg. Sci., Tokyo, Japan). **[A new colorimetric method for determining dichlorvos in insecticidal formulations.]** *Yakugaku Zasshi (J. Pharm. Soc. Jpn.)* 95(12): 1482-1491; 1975. (15 references) (Japanese)

Color reactions between dichlorvos and various ketones in alkaline (0.5*N*) ethanolic solutions were examined to discover the most favorable reagent for the determinations. Acetophenone was the most advantageous reagent, giving an absorption maximum at 480 nm. Dipterex (trichlorfon), naled (dibrom), and dichloroacetaldehyde interfered with the colorimetry; however, dipterex and dichloroacetaldehyde could be removed by extracting dichlorvos with acidic hexane. It was suggested that the color reaction entailed a dehydration reaction between the ketone and dichloroacetaldehyde which was formed by the degradation of dichlorvos. This method is applicable to several types of insecticidal formulations containing dichlorvos but not naled.

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